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FACTORY

MANAGEMENT AND MAINTENANCE

ARCH 1951

Caterpillar's Answers to Six Big Mobilization Problems . . . PAGE 68

Maintenance Program That Fits National Emergency . . . . . PAGE 97

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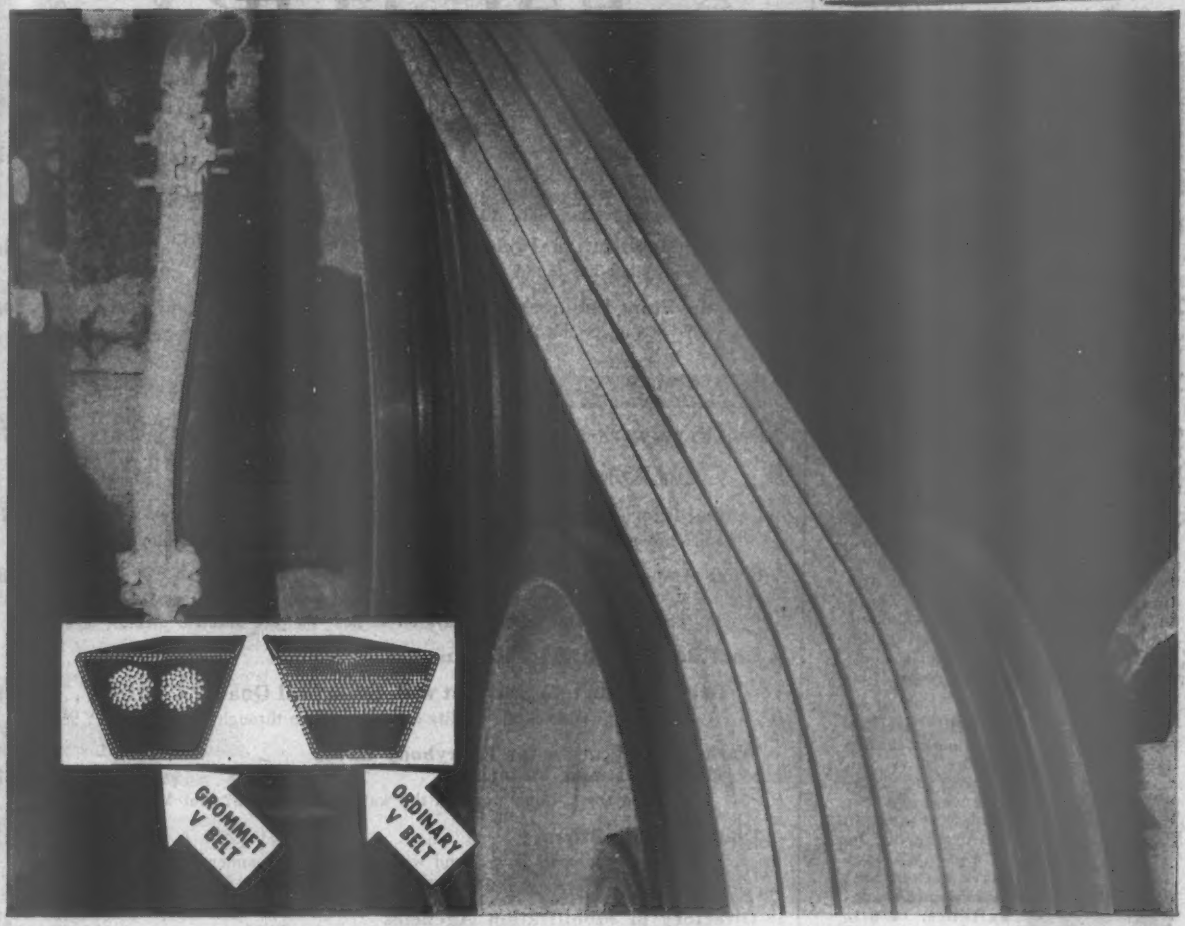

Five grommet V belts doing the work of 8

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THIS is actually an 8-belt drive but a plant accident damaged three of the belts and the engineers decided to let the remaining five belts run and see what happened. They've done the job perfectly because they're B. F. Goodrich grommet V belts — here's where that extra strength comes from:

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Grommet V Belts BY

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RUBBER FOR INDUSTRY

BEHIND THE BYLINE

Latest addition to FACTORY's staff is **JOSEPH W. ST. ANDRE.** People who know him call him Jumpin' Joe.

If he's visited your plant or if you met him at the Maintenance Show in Cleveland you know why. Joe takes over the electrical editor's spot left open by the retirement of George Van Brunt. A graduate of General Electric's engineering school, he's been chief electrical engineer at General Cable, superintendent in charge of electrical construction and maintenance at Wright Aeronautical, and electrical engineer in United Fruit Company's "banana navy."

He spends his spare time bowling and playing golf, and reports "I played softball regularly till I broke my leg playing against a girls' team."

Joe has extensive industrial experience and know-how. He's a member of AIEE. His articles are going to help you keep your electrical equipment running for the duration of the emergency. You'll be seeing a lot of them—and of him. He starts work by writing the eighth article in FACTORY's electrical series (begins on page 114).

CHARLES C. WINSTON left his first job in a railroad maintenance department because he saw "no future in maintenance." After several years in manufacturing, he joined Wallace Clark & Company, management consultants. While working on plant layout, quality control, and production planning problems, he learned of the effective work being done in plant maintenance and was reconverted. Today he's a well-known authority on maintenance. He's put his knowledge to work in co-authoring the article on setting up a maintenance program that starts on page 97.

STEPHEN. C. HAMLIN is the other half of the Wallace Clark team that wrote the article mentioned above. Steve, like Chuck Winston, is a Senior Staff Member. He's specialized in maintenance since he joined the company in early 1946. Has worked since with management in a cross section of industry, including chemicals, airlines, cement, food, and paper. A University of Maine (he comes from Orono) and U. S. Merchant Marine Academy grad, Steve had to pass out two cigars on January 29th, instead of the customary one: He'd become the father of twins.

FACTORY

MANAGEMENT and MAINTENANCE

The Magazine of Plant Management for 59 Years

MARCH, 1951

SPECIAL REPORTS

Six Big Mobilization Problems 68
Caterpillar has found the answers. You can profit from its experience.

How the Plant Engineer Can Save Tax Money ..... BY J. K. LASSER 109
What's deductible? What's not? Rule is simple. Intent is what counts.

PRODUCTION

Cuts Paperwork-Preparation Time From Six Weeks to 15 hours 72
BY H. A. STEWART
Douglas begins with two master cards for each of maybe 150,000 parts.

Central Fileroom for Blueprints Saves 'Em Plenty . BY CHARLES E. STUDEN 77
More people at Hauserman see what they need to see—in much less time.

From Assembly to Storage Automatically 80
Why waste time on handling—when you can get equipment to do it for you? This philosophy certainly pays off at new Western Electric plant.

CAMERA TOUR: Telechron Inc.

Better Product, Lower Cost with Statistical Quality Control 88
Tag along—and see the quality control problem through the FACTORY lens.

Work Simplification for Everybody Saves Manpower and Materials ..... BY J. F. BIGGANE 122
Who says w.s. won't work all the way down the line? Not Maytag.

Doing It With Mirrors 130
DuPont engineers have found wide use for the common mirror. Here's how it can help you—in production, in research, and in employee safety.

Directory of Mobilization Agencies 274
More about the Washington alphabet.

MAINTENANCE

My Best Maintenance Idea—How I Put It to Work BY HENRY M. BRADLEY 86
"Make facts and figures talk," said the author, as he raked in the $100 second prize in FACTORY's Maintenance Idea Contest.

J. K. LASSER has probably saved money for more people than anyone else. He's the author of the best-seller *Your Income Tax* (over 12-million copies so far). That's the yellow-covered book you saw people buying for the last two months. Mr. Lasser is a Certified Public Accountant in four states, is on the staff of four universities, and has written or edited a great many books and articles on affairs financial and economic. On page 109 he puts his vast knowledge of taxes to work, and gives you some vital tips on "How the Plant Engineer Can Save Tax Money."

H. E. TEBROCK brought to his job as medical director for Sylvania Electric a wide and varied background in medicine. He was in private practice for five years. The Navy made him a supervisor of industrial medical control. He did combat medical intelligence duty in the Marine Corps, reporting and consulting on disease and surgical problems—a job that took him around the world eight times. He's done important research jobs on penicillin and the effects of antihistamines. On page 82, he tells what precautions industry must take in using radioactive materials.

Plant Operation Library No. 137:

How to Build a Maintenance Program Now to Fit the National Emergency ..... BY CHARLES C. WINSTON and STEPHEN C. HAMLIN 97

Score your plant on the checklist with this article. It shows you how well you are—or are not—doing. Takes a 75 to pass.

Today's Transformers and Accessories ..... BY J. W. ST. ANDRE 114

No. 8 in a series on latest developments in electrical equipment.

How to Pick the Right Steam Trap ..... BY CHARLES T. LITTLETON 126

Why let yourself in for a headache? Here's how to buy steam traps right—a condensation of advice from a forthcoming book on piping.

See also **SPECIAL REPORTS**

INDUSTRIAL RELATIONS

What Made Gertrude Give? 74

Why, it's morale, of course. Skit based on famous Hawthorne experiment helps Bigelow-Sanford prove it to foremen and supervisors.

Radioactive Materials—You Can Use Them Safely .. BY DR. H. E. TEBROCK 82

A wonderful chance to learn how to handle them safely—from a man who knows, because his company (Sylvania) is already doing it.

Refresher Training Helps Us Win Our War on Waste . BY RICHARD KISLIK and ALFRED R. LATEINER 94

Maiden Form learns that role playing helps supervisors find the right approach to the timely problem of retraining old workers.

Engineers Are Getting Scarcer and Scarcer ..... BY S. C. HOLLISTER 208

A sharp warning—plus a plea for industry and the military to take a close look at technical personnel needs—and fill them effectively.

See also **SPECIAL REPORTS**

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Pinpointing the Manpower Problem 67

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1950 INDEX . . . READY MARCH 1

A complete guide to FACTORY's editorial contents. Write the Editor today for your free copy. Make it the start of a reference file of FACTORY indexes.

(A few copies of 1947, 1948, 1949 indexes are still available. First come, first served)

H. A. STEWART joined Douglas Aircraft Company in 1939, in the production control section. In 1941 he was transferred to tooling, where he set up Douglas' first tool cost system. In June, 1948, he was again transferred, this time to the time standards department, and put in charge of factory tabulation. At that time there were just three applications of tabulating to factory needs. Today, there are 57. On page 72, Mr. Stewart tells how tabulating cards have cut the time necessary to make up parts and materials lists from six weeks to 15 hours.

J. F. BIGGANE is sure that work simplification is the best way to save manhours and materials. So sure that he's not only made it a principle of operation at Maytag (see his article on page 122), but he's also given up golf so that he can spend more time applying work simplification techniques to the building of his new house. Jim—now chief industrial engineer at Maytag—joined the company in 1945. An M.I.T. grad, he's also worked in the container, electrical, and metal furniture industries.

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March, 1951 . . . . . Vol. 109, No. 3

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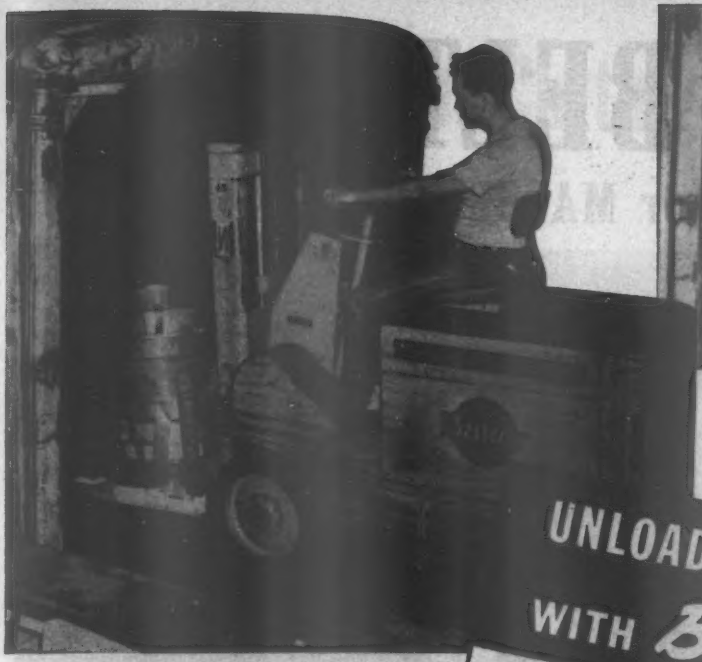

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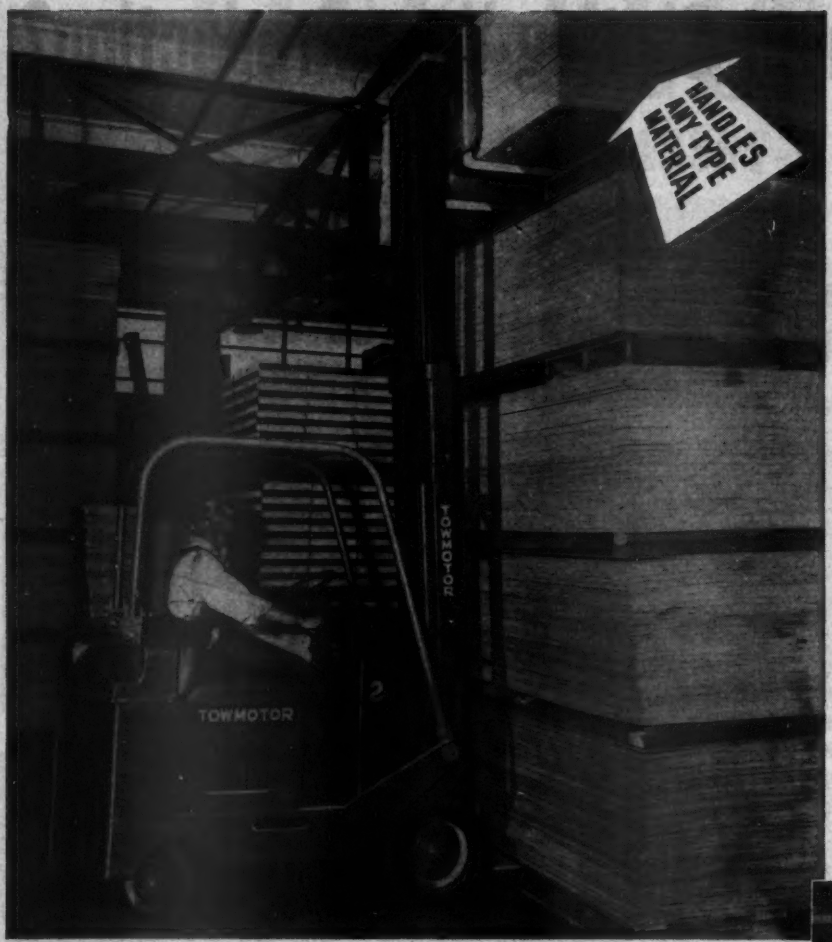

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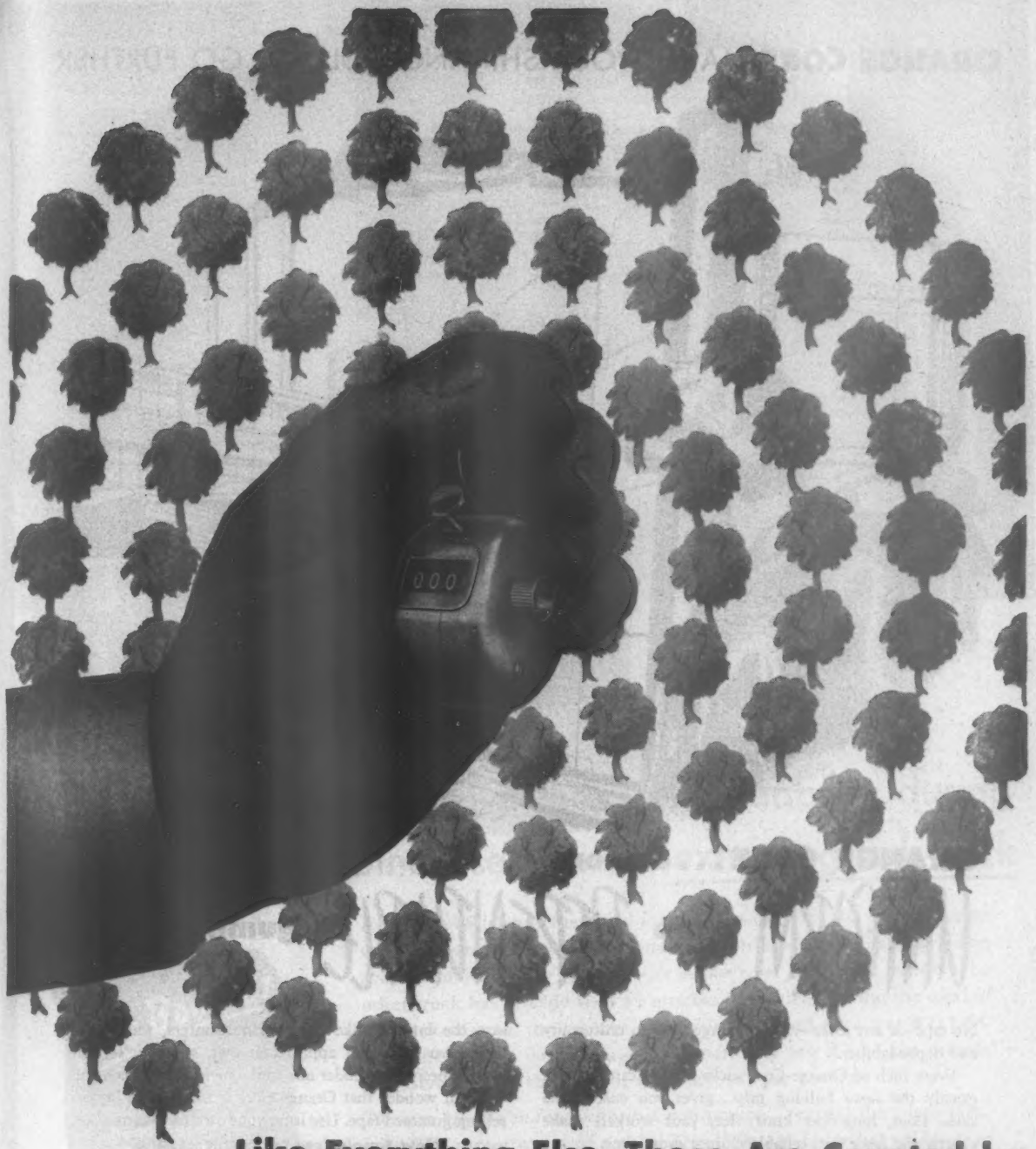

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Extra-rugged **is truly the word for the jobs done by the E-P trucks on this installation. For example, one of the Elwell-Parkers has carried an average of *660 tons in 24 hours—six days a week for over 28 months!* The other truck has already seen 35 months of service. During the total of 63 truck-months, the amount spent for parts and tires was $211.64. Thus the upkeep cost averaged a remarkably low $3.36 per month. Exclusive of tires, the amount was only 85¢ per month.**

"We are *pleased indeed* with this equipment," reports the plant manager. The recent order of a third Elwell-Parker is further evidence of customer satisfaction.

Dependable Elwell-Parkers can cut your handling costs too, by giving years and years of steady service at minimum maintenance. Ask your near-by man for a specific recommendation. The Elwell-Parker Electric Company, 4022 St. Clair Ave., Cleveland 3, Ohio.

ELWELL-PARKER
POWER INDUSTRIAL TRUCKS
Established 1893

PRODUCTION BOOSTER

This motor helps speed production for others

Can it boost output in your plant?

Adjustable-speed for your machines may be just what you need to boost output in your plant. Now, you can get it easily, economically with General Electric's ACA motor. Just glance at this list of machines to which the ACA motor adds productivity by providing low cost adjustable-speed direct from a-c power—

machine tools, pumps, grinders, mixers, pulverizers, punch presses, centrifuges, extruders, printing machines, calenders, fans, feeders, processing lines—any drive that can be improved by economical adjustable speed.

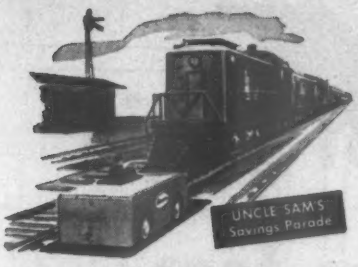
Want the full story for your design engineers? Write for Bulletin GEA-4883A to Section 646-8, Apparatus Department, General Electric Company, Schenectady 5, New York.

By a twist of the knob, the ACA motor gives you the exact right speed for the job at hand. Available in 3:1, 6:1 or 20:1 speed ranges, 3 to 75 hp. It operates directly from 3-phase a-c power. The ACA motor and a standard 3-phase starter are all you need for this economical adjustable-speed drive. Standard NEMA mounting dimensions for ease of installation. Don't miss this chance to boost output of the machines in your plant.

Headquarters for ELECTRICAL ADJUSTABLE-SPEED DRIVES

GENERAL ELECTRIC

646-8



FOR THE NATION'S DEFENSE, Automatic has produced the world's mightiest ELECTRIC Propelled Tractor. Small enough to fit into living room, it can pull a load over 3 *million* pounds, the equivalent of a *125 car freight train*. Whether your material is heavy or light, Automatic has an ELECTRIC TRUCK to move and stack your product.

HANDLING OF WONDER DRUGS becomes everyday routine with Automatic's Skylift, the ELECTRIC Truck you drive like an automobile. In a single 8 hour day, just one Automatic Skylift can lift, move and stack approximately 5000 cases of life-saving penicillin or any other drug product and eliminate hundreds of costly man-hours.

A RIBBON OF STEEL FROM NEW YORK TO ST. LOUIS is a normal day's production of a midwestern strip mill . . . a 300% increase in tonnage, since Automatic developed and produced ELECTRIC trucks capable of handling 60,000 pounds. Previously, production was 15,000 pound coils . . . the maximum that could be handled without shutdowns for rethreading.

Help yourself to these and 1001 more ways to save Handling money

Every day in all industry, these and 1001 other products are handled faster, easier and at as much as 50-75% less cost with Automatic Electric Trucks and Transporters.

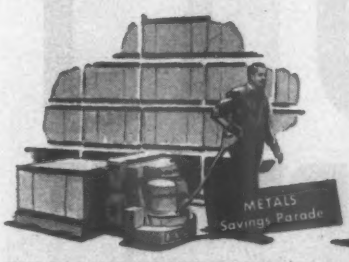
These amazing cost-cutting electric trucks lift, move and stack hundreds of pounds or tons and tons of your products with easy finger-tip control. Empty air space in your warehouse can be turned into extra storage space with Automatic Electric Trucks that stack ceiling high.

You'll find these trucks pay for themselves in as little as months . . . save you costly man hours and release men from back-breaking hand handling for more productive work to help you meet today's stepped up demand.

Let us show you how they speed production, get rid of costly bottlenecks, delayed deliveries . . . help you ship more goods faster. Mail coupon for facts on how to save money in your business.

BEFORE AUTOMATIC ELECTRIC TRUCKS were used to handle paper, it took two men eight hours of hand-handling to move and store skid loads of flat paper stock. Now, it's an easy job for just one man and an Automatic TRANSTACKER. In one instance savings were $4320 a year, including 2900 additional square feet of storage space.

HANDLED WITH CARE . . . enough eggs to feed an average family for 8 years is an easy *one load* job for Automatic SKYLIFT. No matter how fragile your products are, Automatic ELECTRIC Trucks will handle them with complete safety . . . bring you added savings by reducing product damage.



UNLOADING HEAVY TINPLATE in bundles weighing 2,800 pounds each from freight cars by hand used to take 9 men 3 hours . . . 27 man-hours. Today with Automatic Transporters, 3 men do the same job in only one hour . . . 24 costly man-hours saved on one job . . . 6 men made available for more productive work.

NEW CARS cost less because this powerful Automatic ELECTRIC Truck saves the manufacturer money . . . lowers the cost to you. Even the huge 86,000 pound dies used to manufacture these automobiles are easily lifted and moved, with only a fraction of the power in this mighty ELECTRIC Truck that can handle up to 110,000 pounds.

100,000 ITEMS are handled at the rate of 30 carloads a day in just one warehouse. With cost-cutting Automatic ELECTRIC Trucks they move, lift and stack; everything from cumbersome carpets and furnaces to clothing and cosmetics with equal speed, ease and economy . . . and make extra storage space available.

Automatic's Parade of Electric Trucks

"101" Transporter

"101" Transtacker

Automatic Skylift

No One Makes Electric Trucks Like Automatic . . . No Trucks Cost Less to Operate

AUTOMATIC TRANSPORTATION CO.
DIV. OF THE YALE & TOWNE MFG. CO.
39 W 57th Street, Dept. C-5, Chicago 20, Ill.

Please send FREE Money-Saver CHECK CHART of 8 Important Material Handling Questions, and Booklet: "How to Make Your Material Handling Pay Dividends."

Company .....

By ..... Position .....

Address .....

City ..... Zone ..... State .....

For YOUR NORMAL NEEDS

LYON offers more than 1500 regularly cataloged items of steel equipment engineered to meet your civilian or defense production requirements. See list below.

For DEFENSE SUBCONTRACTS

Complete sheet metal facilities to handle gauges 10 to 24. Two strategically located plants, 1500 trained workers, our own toolrooms, 3800 contracts in World War II.

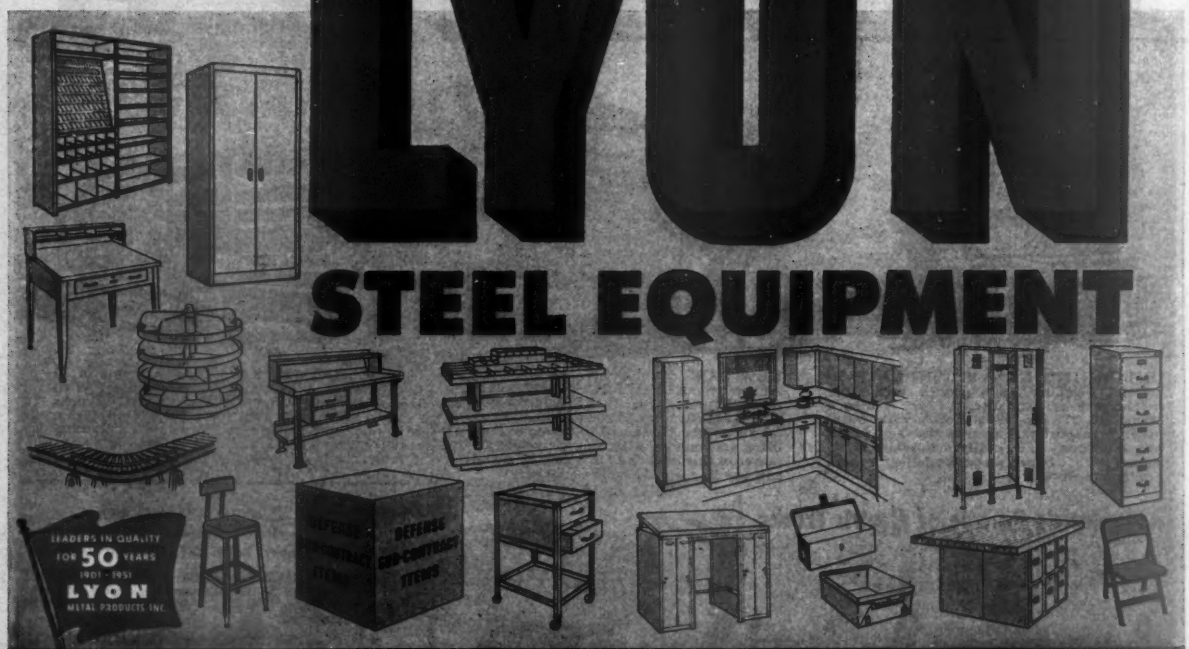
2 STRATEGIC PLANTS . . . AURORA, ILL., AND YORK, PA.

LYON METAL PRODUCTS, INCORPORATED

General Offices: 312 Monroe Avenue, Aurora, Illinois

Sold Nationally through Factory Branches and Dealers

LYON STEEL EQUIPMENT



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piping repairs cost more now!

No. 488 Iron Body Clamp Gate

You make them less often by using Dependable Quality

CRANE VALVES

...That's why more Crane Valves are used than any other make

easy access prevents trouble with this valve

Remove just two nuts to dismantle this gate valve for inspection, cleaning, or repairs—without taking it from the line. Reassemble just as easily, knowing that Crane clamp design keeps the bonnet joint snug and accurately aligned. Use Crane Clamp Gates on steam, water, and air, but especially in heavy fluid lines needing periodic cleanout. They'll save time, labor, and encourage regular servicing that prevents valve trouble.

Combining easy access with highly dependable service features, Crane Clamp Gates typify Crane Quality—*better valve performance at lowest ultimate cost.*

CRANE

CRANE CO., *General Offices:*
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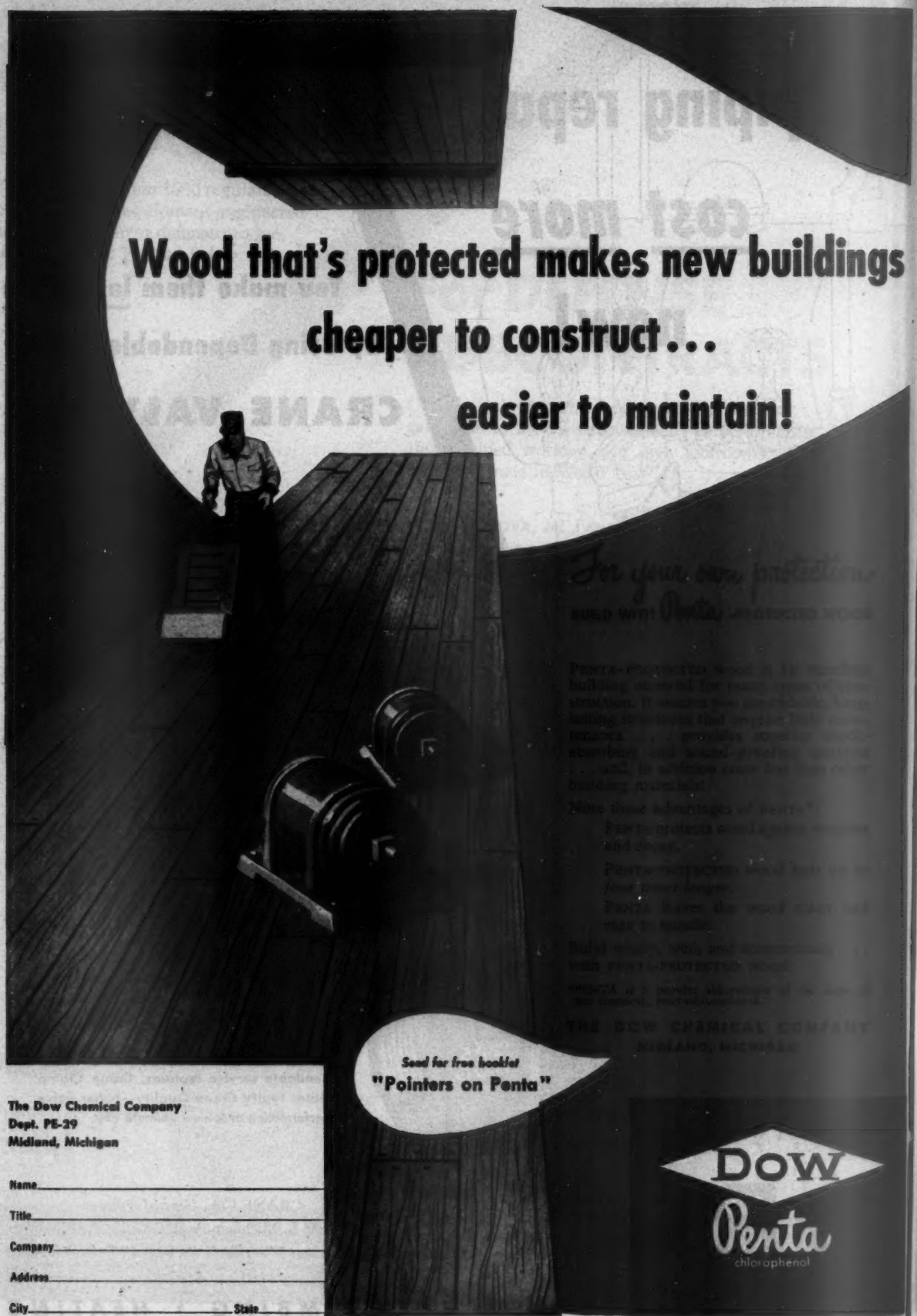
Branches and Wholesalers Serving All Industrial Areas

VALVES • FITTINGS • PIPE • PLUMBING • HEATING

Wood that's protected makes new buildings cheaper to construct... easier to maintain!



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"Pointers on Penta"

The Dow Chemical Company
Dept. PE-29
Midland, Michigan

Name_____

Title_____

Company_____

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DOW
Penta
chlorophenol

Why Price Lists on Paint are ALL WRONG!

Never try to figure the cost of a maintenance paint job from a price list. You can lose your shirt. Because all that price list gives you is the cost of paint *per gallon* . . . which is very, *very* misleading.

For instance . . . look at your price lists and you'll find that famous Barreled Sunlight may cost a few more pennies per gallon than many other good paints. But if you compare Barreled Sunlight with *any* other paint . . . *not* by price per gallon but by *actual on-the-wall performance* . . . you'll see what we mean.

Painting costs are determined not by how much less you pay per gallon, but by how much less paint you have to buy and by how much less labor it takes to put it on. That's where Barreled Sunlight shines.

Compare Barreled Sunlight with any other paint . . . by square feet per gallon, for man hours per job, for brightness and years of service . . . and you'll find that Barreled Sunlight will give you a longer lasting, better looking paint job for less money than any other paint.

Our representative will explain a very simple test that will prove our point for *your* profit. Write and he'll call.

BARRELED SUNLIGHT PAINT CO.
2-C Dudley St., Providence, R. I.

Barreled Sunlight Paints

In whitest white or clean, clear, pleasing colors, there's a Barreled Sunlight Paint for every job

YOU CAN BE SURE.. IF IT'S

Westinghouse

One Set of Connections

THAT'S ALL!

No need to install separate switches and protective devices with Westinghouse Dry-Type Transformers, Types AJRB and AVRB. They have circuit breakers built in!

It's a better installation, too. The integral breaker gives three-way protection . . . something no combination of transformer and external protectors can do. Because the breaker is located inside the transformer case, it is actuated by (1) overcurrent, (2) temperature, or (3) by both in combination. Greater safety for equipment on the line! Better protection for the installation!

Available in ratings from 100 to 15 kva (Type AVRB) and 10 to 3 kva (Type AJRB). Other dry-type transformers without breakers are available.

Ask your Westinghouse representative for further information, or write for Booklets B-4009 and B-4439. Westinghouse Electric Corporation, P. O. Box 868, Pittsburgh 30, Pennsylvania. J-70577

Westinghouse

DRY-TYPE TRANSFORMERS

American Armament Demands Speed...
Speed Demands American Phillips Fastening

GET YOUR GUN
and get going!

Get More Speed...More Accuracy...Firmer Fastenings... the American Phillips Way

IF you've got a D-O, then "give it the gun"... the *American Phillips* gun... and watch the assemblies roll out faster than with any other fastening method... *as much as 50% faster!*

Power-driven American Phillips fastenings are easier and quicker *for anyone* to make... because recessed screwhead and 4-winged driver align automatically, and drive straight to a tight, flush fastening the *first* time, *every* time.

Have American engineer this top speed and accuracy into *your* assembly departments... with any Phillips product, including machine screws, SEMS assemblies, stove bolts, tapping screws, thread-cutting screws, wood screws, roll thread, thread-forming, thread-cutting and self-locking fastenings. *Write:*

4-WINGED DRIVER CAN'T SLIP OUT OF PHILLIPS TAPERED RECESS

AMERICAN SCREW COMPANY

PHILLIPS HEADquarters
WILLIMANTIC, CONNECTICUT

Plants at Willimantic and Norristown, Pa.

Warehouse and offices at Chicago

"WE WERE LOSING 5 KILN MOTORS PER MONTH UNTIL WE CHANGED TO FUSETRON dual-element FUSES."

Malvin E. Adams.
Electrician

OZARK HARDWOOD COMPANY

PHONE 282

JOE B. MILLS, MANAGER

CLARKSVILLE, ARKANSAS
April 20, 1950

Bussmann Manufacturing Co.

St. Louis, Missouri

Dear Sir:

I have found a great savings in your Fusetrons.

Two and one-half years ago I started changing my Dry Kiln motors to Fusetron protection. Up until I changed completely I was loosing an average of 5 motors per month which was very expensive. I was having to fuse my motors too heavy to pick up the load, then if something went wrong the fuse were too heavy and held the motor on the line, therefore burning it up.

My Kiln motors are 1½ h.p. 5 amp. I fuse them with 5 amp fusetron. The fusetron will hold this starting load and when it picks up I still have motor protection if anything goes wrong the fusetron will blow in time to keep the motor from burning up. I fuse my main pannell with 6 - 600 amp. fuzetron. I used to blow fuses on this until I changed to fuzetron, therefore, taking care of the surging load.

I have approximately 800 h.p. I fuse almost all the plant on fusetron. My trouble has been very light since changing to fusetron for motor protection Fuzetron is tops with me.

Yours very truly,

Malvin E. Adams

Malvin E. Adams
Electrician

FUSETRON

TRUSTWORTHY NAMES IN ELECTRICAL PROTECTION

BUSS

Fusetron DUAL ELEMENT Fuses

Give 10 Point Protection

- ★Protect against short circuits.
- Protect against needless blows caused by harmless overloads.
- Protect against needless blows caused by excessive heating — lesser resistance results in much cooler operation.
- Provide thermal protection — for panels and switches against damage from heating due to poor contact.
- Protect motors against burnout from overloading.
- Protect motors against burnout due to single phasing.
- Give DOUBLE burnout protection to large motors — without extra cost.
- Make protection of small motors simple and inexpensive.
- Protect against waste of space and money — permit use of proper size switches and panels.
- Protect coils, transformers and solenoids against burnout.

★ Fusetron Fuses have high interrupting capacity as shown by tests of the Electrical Testing Laboratories of New York City in December 1947.

What is the FUSETRON Dual-Element FUSE?

A fuse link combined with a thermal cut-out — the result, a fuse with tremendous time-lag and much less electrical resistance.

They have the same degree of Underwriters' Laboratories approval for both motor-running and circuit protection as the most expensive devices made.

Made to same dimensions as ordinary fuses, FUSETRON Fuses fit all standard fuse holders.

Obtainable in all sizes from 1/10 to 600 ampere, both 250 and 600 volt types. Also in plug types for 125 volt circuits.

Their cost is surprisingly low.

Don't risk losses in your plant!

One **lost** motor,
One **needless** shutdown,
One **destroyed** panel or switch,
One **burned out** solenoid —
May cost you more than replacing every ordinary fuse with a FUSETRON dual-element fuse.

Fusetron is a trade mark of Bussmann Mfg. Co., Division of McGraw Electric Co.

Bussmann Mfg. Co., University at Jefferson, St. Louis 7, Mo. (Division McGraw Electric Co.)

Please send me complete facts about FUSETRON Dual-Element FUSES.

*Name*_____

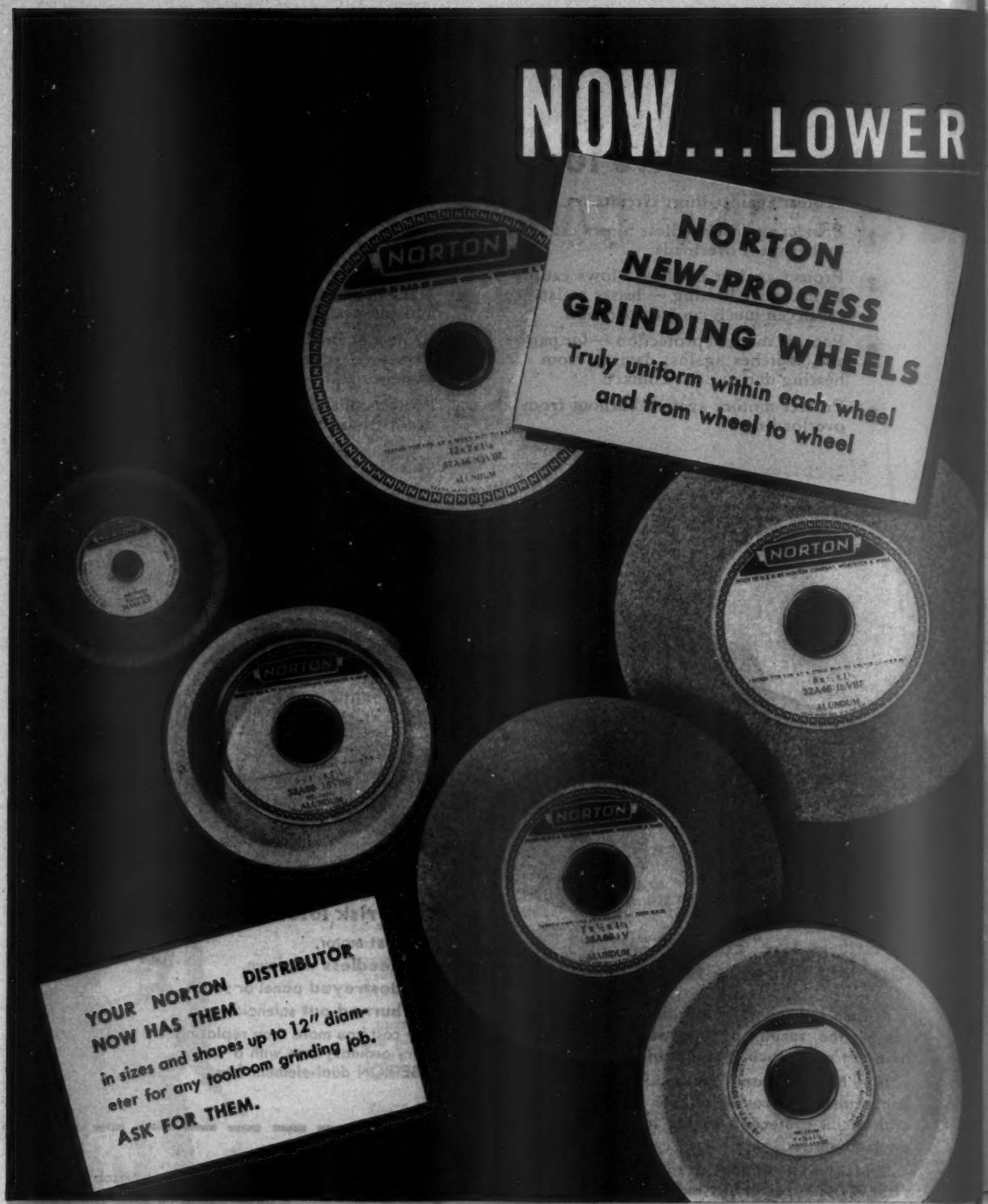
*Title*_____

*Company*_____

*Address*_____

*City*_____ *State*_____ 351

NOW... LOWER



WHAT IS THE NEW NORTON PROCESS?
Developed and installed by Norton engineers in a new 5-acre plant, it is a streamlined, precision process that produces grinding wheels to a degree of uniformity never before thought possible. The process involves production equipment and quality control methods that assure the uniformity of all mixing, molding, firing, and finishing operations. The result: uniform structure, inherent balance and grinding efficiency unmatched in the entire abrasive field.

YOUR TOOLROOM GRINDING COSTS

with the most uniform wheels ever produced!

Only Norton *New-Process* Wheels Give You All 3 Advantages

1. BUILT-IN BALANCE reduces vibration in operation. The wheel hugs the work. You can grind to closer tolerances and smoother finishes. No more chatter marks! What's more, this balance is inherent. It stays for the life of each wheel.

2. MORE UNIFORM STRUCTURE means consistent grinding action throughout each wheel and from wheel to wheel . . . more even wear for longer life . . . fewer machine adjustments . . . less risk of tool spoilage . . . assurance that all wheels with identical markings will give you the same top-grade performance.

3. FASTER, SMOOTHER, MORE EFFICIENT CUTTING ACTION comes from the right selection of the various Norton abrasives plus the features of the *new process*. These wheels allow deeper cuts in expensive, heat-sensitive high-speed steel and cast alloy tools without drawing their temper. They also stay sharp longer . . . make frequent dressings unnecessary . . . a big saving in time and toolroom grinding costs.

RUN A TEST! If you haven't already standardized on Norton *New-Process* Wheels in your toolroom, run a comparative test right away. Your nearby Norton distributor or representative will help you select from the several types of Alundum* abrasives the wheels that will cut your costs on any tool grinding job.

NORTON COMPANY, Worcester 6, Mass.
Warehouses in 5 cities. Distributors in all principal cities.

*Trade-Mark Reg. U. S. Pat. Off. and Foreign Countries

NORTON
ABRASIVES
Making better products to make other products better

YOU SAVE TIME sharpening spiral milling cutters with Norton *New-Process* Alundum Wheels because they stay sharp and hold their size much longer than ordinary wheels.

YOU REDUCE SPOILAGE in backing off reamers with Norton *New-Process* Alundum Wheels because their free, cool cutting action does not draw the temper.

YOU GET CHATTER-FREE FINISHES when you use Norton *New-Process* Alundum Wheels on your toolroom surface grinders because their built-in balance makes them run smoother.

YOU GET ALL THE FACTS about lowering toolroom grinding costs in this 162-page handbook on Toolroom Grinding. Write for your free copy of Form 835A3.

looking for machine tools?

Sweet's File for the Mechanical Industries

1 machine tools and other production equipment

machine tools	a
cutting tools	d
portable and hand tools	e
gages	f
pressing and forming	g
welding and brazing	h
marking	i
finishing	J

2 mechanical equipment

material handling	a
power transmission	b
pumps and compressors	c
pipe and fittings	d
valves and traps	e
instruments and controls	g
lubrication	h
miscellaneous equipment and supplies	i

3 electrical equipment

motors and generators	a
controls	b

4 materials

metals	a
glass	d
thermal insulation	e
refractories	f
vibration isolation	g
roofing and siding	h
waterproofing and dampproofing	i
flooring and wall covering	J
paints and finishes	k

5 structural equipment

structural systems	a
doors and hardware	b
skylights and ventilators	c
partitions, fences and guards	d

6 plant utilities

power generation	a
water conditioning	b
air conditioning and refrigeration	c
lighting	d

7 service equipment, special services

service equipment	a
special services	b

A TIP ON FILING LOOSE CATALOGS. A good filing system must be a good finding system. Research and experience in making manufacturers' catalogs quickly and easily accessible have resulted in the improved classification systems now used in the various Sweet's Files. You may wish to use the classification system illustrated here for filing, and easily finding, individually received catalogs, specification sheets, detail drawings, technical articles, etc. In this way, too, ideal coordination can be achieved between file drawer and the catalogs pre-filed in your Sweet's File for the Mechanical Industries.

reach for Sweet's **. . . all these manufacturers' catalogs — containing comprehensive information on machine tools, attachments and accessories—are instantly available in Section 1 of your Sweet's File for the Mechanical Industries.**

The other sections of this Sweet's File contain additional manufacturers' catalogs covering a wide range of materials and equipment. You will find useful and up-to-date information on product forms, characteristics, performance and use.

This grouping of manufacturers' catalogs, in sections according to products or use of products, is made for your convenience, so that you can more readily compare one product with another. Indexes of manufacturers, products and trade names lead you quickly and easily to the catalogs you are looking for.

Sweet's is working constantly to get more manufacturers to send you their catalogs in this easy-to-use form. If you fail to find what you want in your Sweet's File, please tell us.

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DIVISION OF F. W. DODGE CORPORATION

119 WEST 40th STREET NEW YORK 18, N. Y.

is overloaded wiring breaking your production chain?

Your plant wiring may be the weak link in your production chain.

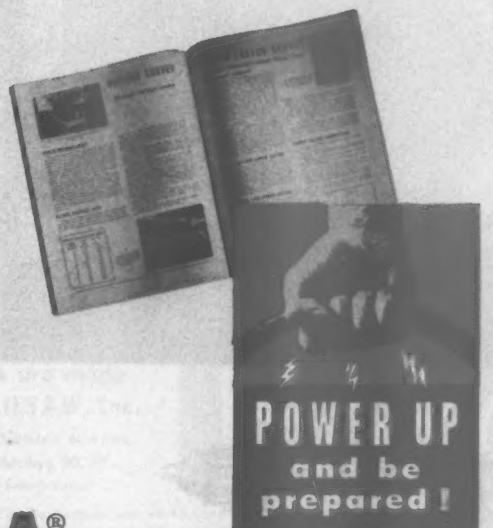
When the voltage drops at your machines, those machines slow down—and so does their production! This is happening in 9 out of 10 industrial plants—all because they're equipped with obsolete, inadequate wiring systems.

You're paying for power — make sure you make full use of what you pay for. A *modern* plant wiring system delivers to the machine the power you pay for at the meter . . . and guards you against costly power loss.

Today more than ever full-scale production is vitally important to our national defense. Strong national defense requires full production . . . and full production requires an adequate wiring system. Call your plant, utility or consulting engineer or your electrical contractor today and make arrangements to have him survey your wiring system.

Most important of all, send for your free copy of *"Power Up—And Be Prepared."* This complete modern wiring guide shows you how you can determine quickly and easily the exact condition of your plant wiring system. Anaconda Wire & Cable Company, 25 Broadway, New York 4, New York.

81336



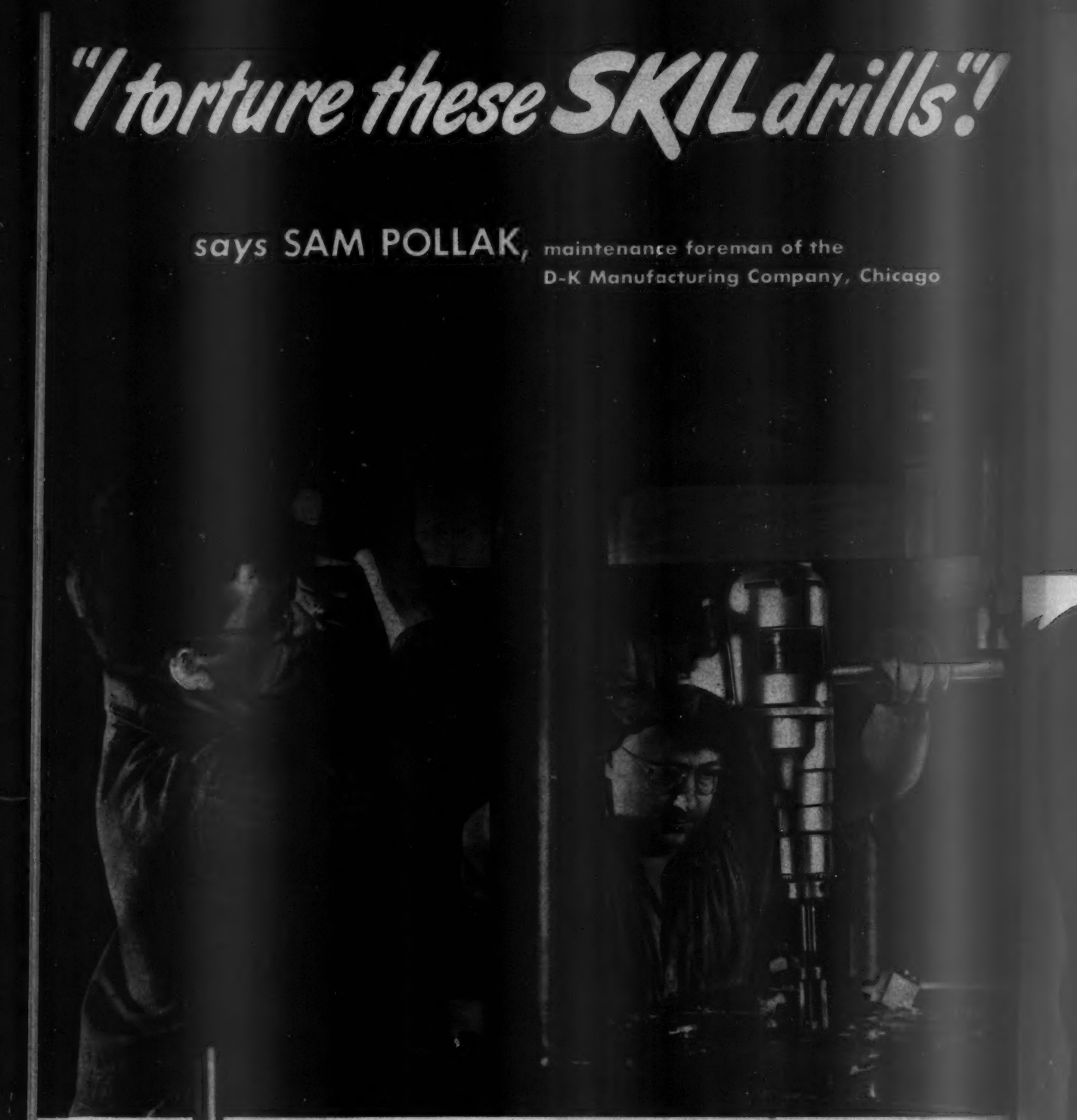
the right cable for the job

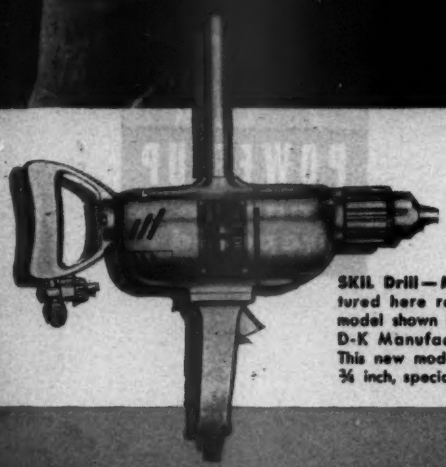
ANACONDA®

WIRE AND CABLE

"I torture these SKIL drills"!

says SAM POLLAK, maintenance foreman of the D-K Manufacturing Company, Chicago





SKIL Drill—Model 2121, pictured here replaces the older model shown in use here at the D-K Manufacturing Company. This new model is a low-speed, ¾ inch, special duty model.

4 year's punishment without faltering

SAM POLLAK says: "SKIL Drills are built to take punishment" . . . and proves it by using this drill to ream out cushion pin holes in press beds. These holes are 3 inches deep, 1¼ inches in diameter . . . a steel surface of about 11½ square inches. "We've been using the drill on this job for four years and it has never faltered or needed repair."

Job-Proved for tough going

POWER TO SPARE FOR TIGHT SPACES

Sam Pollak's use of his SKIL Drill Model 47 is typical of the demands called for on this job. This compact drill is small enough for work in close quarters . . . has the power to drill with oversized bits . . . power far beyond the work-rating of the drill. Tough? Sure, but this SKIL Drill has been doing the job for over four years.

SMOOTH BORE FOR SOLID MACHINE MOUNTING

SKIL Drills on this job must have more than ruggedness . . . *accuracy* is important too. When the D-K Manufacturing Company added more machines to their plant, all the footings were drilled in concrete with SKIL Drills. Mr. Pollak reports: "The slow drilling speed and the lack of vibration made my SKIL Drill perfect for the job. Each hole was in its place and the lack of wobble made a smooth bore all the way down. The machines were mounted solidly and not one footing has needed any repair."

25 SKIL DRILL MODELS . . . a SKIL Drill for every purpose, every place, and every problem. See your SKIL Distributor for demonstrations and complete information.

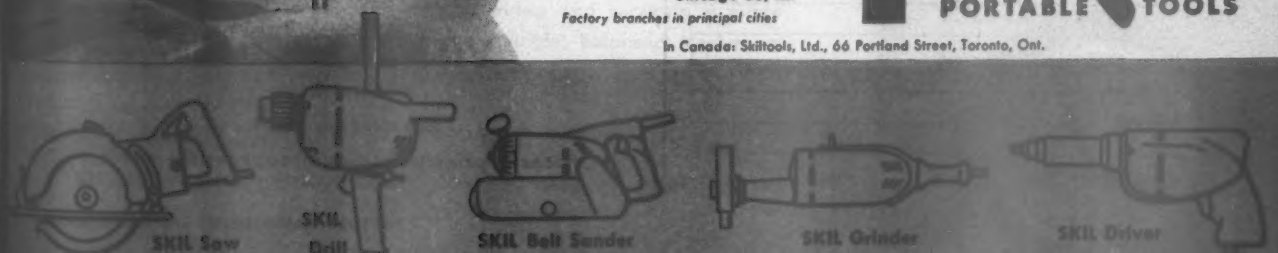
SKIL Products are made only by SKILSAW, Inc.

5033 Elston Avenue,
Chicago 30, Ill.

Factory branches in principal cities

SKIL PORTABLE TOOLS

In Canada: Skiltools, Ltd., 66 Portland Street, Toronto, Ont.



ONLY Results COUNT

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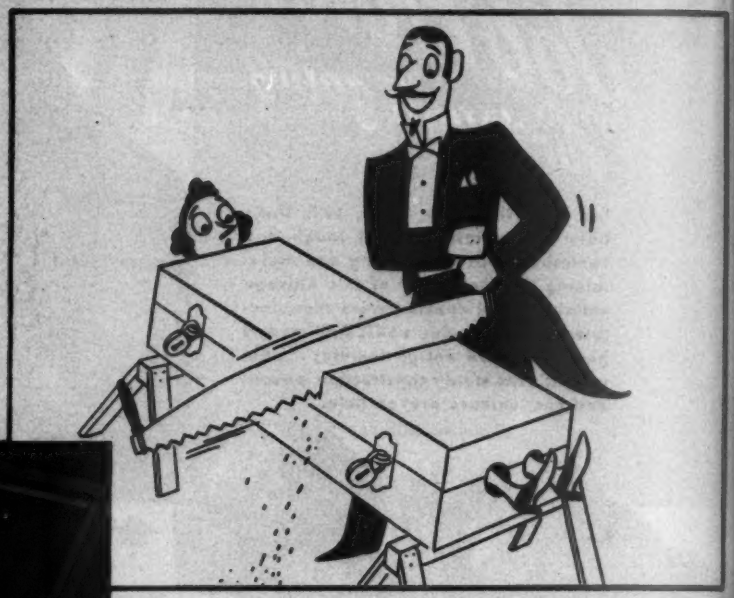

CUT YOUR RECORD-KEEPING COSTS IN HALF...

Keep any and all vital records visible, up to date and instantly accessible with *VISI*record. Here is the most adaptable record-keeping system in the world—for any business and all industry . . . small or large.

During these days of planning for defense production, the importance of vital records cannot be stressed enough. With *VISI*record there is positive control over Personnel, Sales, Production, Inventory, Stores, Accounts Receivable.

- ★ Compactness and economy of vertical filing with "plus" value of visible filing.
- ★ The "finger-tip" control means minimum effort and time saved.
- ★ No limit to sizes . . . cards are designed for your particular needs and housing of *VISI*record is easy and automatic.
- ★ "Low cost" maintenance of file—expansion and contraction easy and quick.
- ★ Unlimited application to all types of business records—hand and machine posted.
- ★ THE time-saving visible record keeping system.

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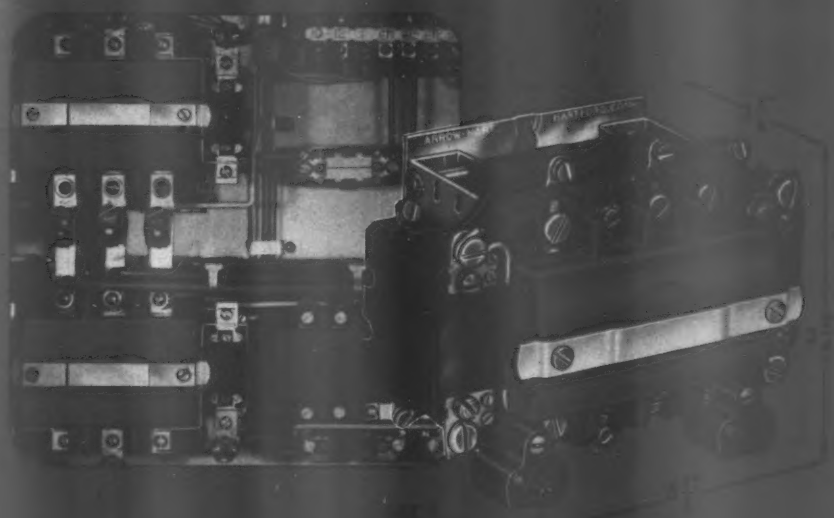
Offices in principal cities throughout the world.

BRING OUT **BUILT-IN PERFORMANCE** OF MOTORS AND MACHINERY



PANEL MOUNTED

SURFACE MOUNTED

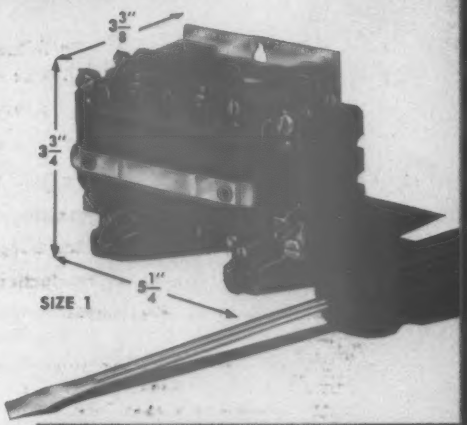
NEW TYPE "RA"

ARROW AH HART

MAGNETIC STARTERS

JUST 1/2 THE SPACE

PLUS EASY, LOW COST MAINTENANCE



Arrow-Hart Type "RA" Magnetic Starters and Contactors are designed with easy, low cost maintenance in mind. Because the A-H starter occupies only ½ the space of conventional starters, there's more working room in the box, less space required for control panel layout. Wiring is easier, because it's straight-thru all the way. All terminals and contacts are easy to reach. Terminals are front wired. Line and load wires connect at opposite ends. The switch itself is easily installed with three mounting screws. Contact inspection or replacement is readily made by loosening two hood retaining screws. This ease of wiring and servicing is made possible by the revolutionary "RA" (Right Angle) Balanced Mechanism exclusive in Arrow-Hart starters.

BUY WITH CONFIDENCE ***PROFIT BY PERFORMANCE***

THE ARROW-HART & HEGEMAN ELECTRIC COMPANY, HARTFORD, CONN., U. S. A.

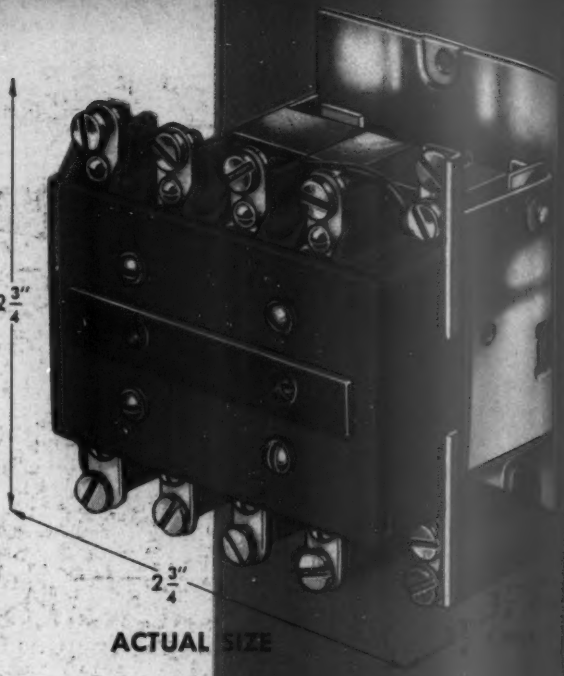
ARROW AH HART

INCHES SMALLER...

EVERY INCH A CHAMPION!

NEW AH SIZE 00

Type "CRA" CONTACTOR



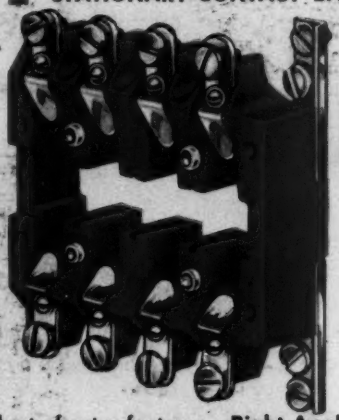
ACTUAL SIZE

The revolutionary new Arrow-Hart Size 00 Type "CRA" Contactor measures just 2¾" x 2¾" — cuts inches off any other contactor on the market — yet is every inch a champion! Take the design: from Arrow-Hart's exclusive new "RA" (Right Angle) mechanism — the same which enabled A-H engineers to build the compact control package described on the preceding page — to the 00's ***automatic*** positive contact pressure control, this ingenious multi-pole convertible contactor results in big savings of space, work, time, money; assures you unparalleled performance throughout its long life.

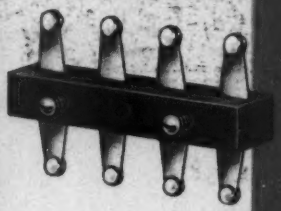
ONLY 4 BASIC SECTIONS

1 COVER PLATE

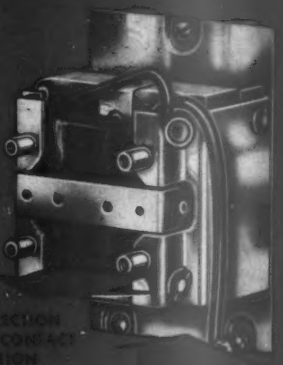
2 STATIONARY CONTACT BASE



3 MOVABLE CONTACT UNIT



4 FRAME WITH COIL AND MECHANISM ASSEMBLY



DIRECTION OF CONTACT ACTION

Here are just a few of its host of extra features: **Right Angle mechanism, reducing size by as much as ¾ • Ultra-functional design • Fewer components — reduced handling • No-twist no-rock frame • Compactness within own framework • Unit stability and rigidity • Foolproof, guided assembly throughout • Contacts operate in vertical position • Self-aligning contact action • Unusual ability to handle a multiplicity of circuits • Movable contact carrier • Enclosed contact chambers • All wiring in line and straight-thru • Mat-finished cover plate for terminal markings • and many more.**

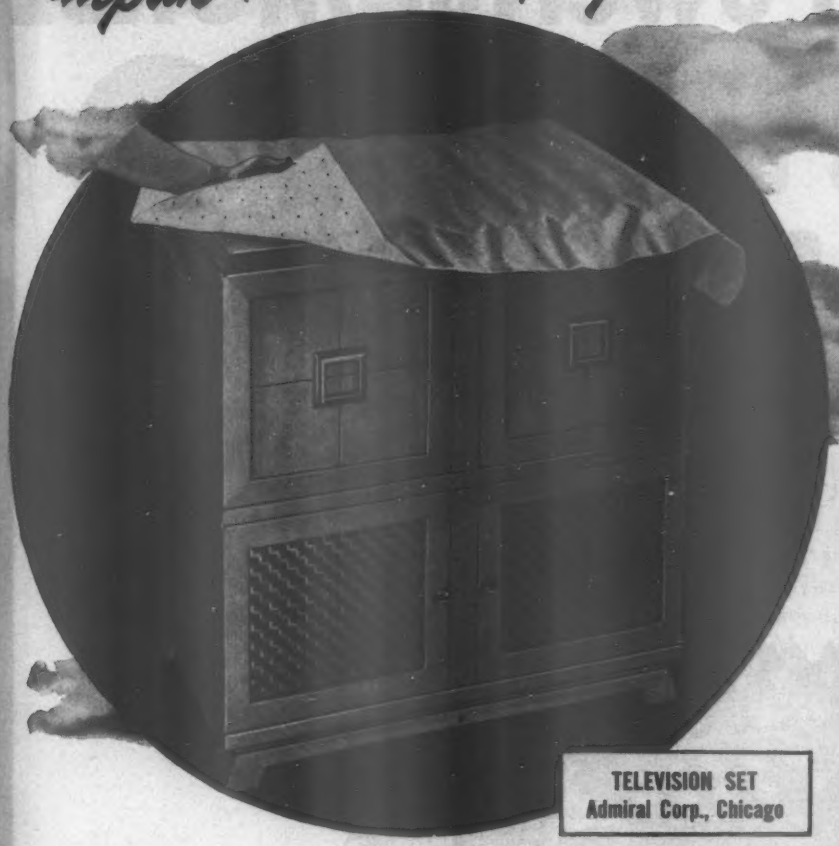
Get all the facts about the A-H Size 00 Type "CRA" Contactor, available in 3 and 4 pole types. Send for Engineering Data Folder.

ARROW·HART

THE ARROW-HART & HEGEMAN ELECTRIC COMPANY
103 HAWTHORN STREET
HARTFORD 6, CONNECTICUT, U.S.A.

Branch Warehouses: BOSTON, CHICAGO, CLEVELAND, CINCINNATI, DALLAS, DENVER, DETROIT, LOS ANGELES, NEW YORK, PHILADELPHIA, SAN FRANCISCO, SYRACUSE. In Canada: ARROW-HART & HEGEMAN (CANADA) LTD., ST. CATHARINES, ONTARIO

Kimpak Float Packaging*



TELEVISION SET
Admiral Corp., Chicago

Cosmetics, by
Max Factor & Co., Hollywood, California.

Sterilizer, manufactured by
Pelton & Crane, Detroit, Michigan.

Cuts shipping costs— reduces damage in transit!

Have you ever received a compliment on the packaging of your product? Have you ever been told by a customer that your products always arrive in perfect condition—and looking fresh, neat, attractive? Most companies never do, until they switch to KIMPAK* Float Packaging—the world's cleanest, most effective shipping protection.

KIMPAK creped wadding not only affords maximum protection (at lowest true cost), but helps make your product look "well-dressed." Soft, snowy-white KIMPAK is available in various thicknesses to provide optimum protection from damage to your product—and in a wide range of roll and sheet sizes to facilitate your packaging operation. It's easy to handle, too—saves literally hours in the shipping room—then defends against damage from shock, scratching and vibration. It cushions your product during rail, truck, air or water transit, as well as in storage.

Try KIMPAK soon—for any of the Four Basic Methods of Interior Packaging: Bracing and Blocking, Flotation, Surface Protection, Absorbent Packaging. For complete information, see your nearest KIMPAK distributor listed in classified telephone directories under "Packing Materials" or "Packing Materials—Shipping"; or write to Kimberly-Clark Corporation, Neenah, Wisconsin.

FREE BOOKLET!

KIMBERLY-CLARK CORPORATION
Neenah, Wisconsin FM M-351
Please send me free, the illustrated KIMPAK booklet, "Float Packaging."

Name _____

Address _____

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Kimpak

A PRODUCT OF Kimberly Clark RESEARCH

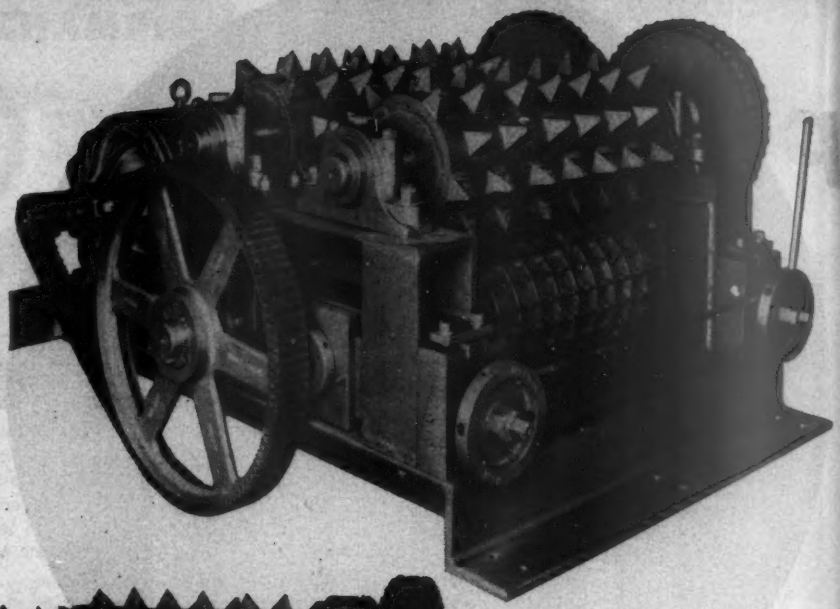
REG. U.S. PAT. OFF. & FOREIGN COUNTRIES

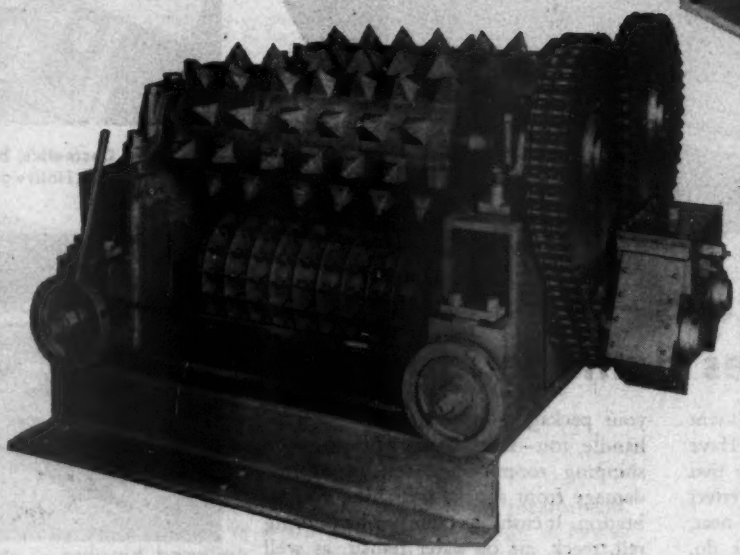
CREPED WADDING

*T. M. REG. U. S. PAT. OFF. & FOREIGN COUNTRIES

Powerful MORSE C

Morse Silent Chain Drives maintain absolutely constant speed ratio. They are unaffected by atmospheric conditions or idleness. Morse Silent Chain Drives need but few adjustments to maintain tension, save valuable servicing and replacement time. The exclusive Morse Rocker Joint gives Morse Silent Chain Drives highest operating efficiency and longest possible life by substituting rolling for sliding action.



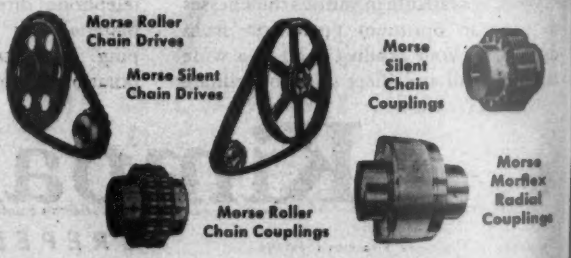


Precision-made Morse Roller Chain Drives use teeth, not tension. And that means positive power transmission. There is no slippage. Friction loss is slight, constant ratios are maintained. Morse Roller Chain Drives save space, operate equally well on short or long centers. They give extra-long, trouble-free life.

Ask the Morse Man for power transmission information!

100 Morse Branch Offices and Distributors to supply your power transmission demands.

From coast to coast there are more than 100 offices, representatives and distributors of Morse Power Transmission products to give you quick information and service when you want it—where you want it. *Ask the Morse Man first in any case!* Check your classified phone directory under **"Power Transmission"** or **"Chains"** for the nearest Morse Man.


Morse Roller Chain Drives
Morse Silent Chain Drives
Morse Silent Chain Couplings
Morse Roller Chain Couplings
Morse Morflex Radial Couplings

CHAIN DRIVES put the bite on coal...

THE Gundlach Two-Stage Coal Crusher reduces run-of-mine coal to stoker coal in one operation. Coal is gravity fed to heavy, tooth-studded roller-jaws, is broken, dropped to bottom rollers, crushed to correct size, carried away. Rugged Morse Chain Drives deliver this machine's powerful bite. A Morse Silent Chain Drive delivers maximum power from the motor and takes the heavy shock loads in its stride. Two Morse Roller Chain Drives in the ingenious power transmission system turn primary rollers. Controls connected by a Morse Roller Chain are operated by a single lever.

Morse offers a complete line of top-quality power transmission equipment. Turn to Morse to solve your power problems as Gundlach has. For complete information, write

MORSE CHAIN COMPANY
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Morse *means* Power Transmission

MORSE
MECHANICAL
POWER TRANSMISSION
PRODUCTS

PRODUCTS OF BW BORG-WARNER

HERE'S WHY
MAINTENANCE
MEN SAY

SPECIAL GREASE-PROOF KENTILE is ideal for industrial installations

and costs approximately 40¢ a sq. ft!*

PETROLEUM oils and greases will stain and soften many floors . . . but not SPECIAL KENTILE! And it's impervious to alcohols, alkalis and most acid solutions. Of course, like regular Kentile, it can be installed any place . . . over smooth concrete, wood or metal floors . . . even below grade on concrete in direct contact with the earth.

The grease-resistant properties of SPECIAL KENTILE also serve to best advantage in non-manufacturing areas such as locker rooms, lunch rooms and rest rooms where industrial wastes tracked underfoot cause floors to stain and soften, resulting in all-too-regular repairs or replacement. SPECIAL KENTILE provides years of trouble-free wear and minimum maintenance expenses no matter how hard the usage.

SPECIAL KENTILE now comes in new lighter, brighter colors to help create the cheerful atmosphere that means increased efficiency.

• Install KENBASE to complete your SPECIAL KENTILE floor. It goes directly against any smooth wall where it meets the floor area and seals dirt-catching cracks and crevices. You need never paint it and scuff and mop marks won't show.

*Prices for Special Kentile for ⅛" thickness may be considerably lower or slightly higher depending upon the size and condition of your floor and the freight rates to your city. Ask your Kentile Dealer for an estimate for *your* floor. He's listed under FLOORING in your classified phone directory.

KENTILE.

The Asphalt Tile of Enduring Beauty

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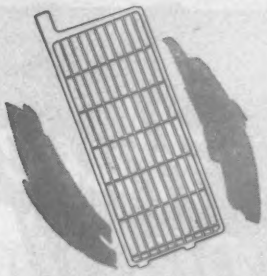
KENTILE, INC., 58 Second Ave., Brooklyn 15, N. Y. • 350 Fifth Ave., New York 1, N. Y. • 705 Architects Building, 17th and Sansom Streets, Philadelphia 3, Pa. • 1211 NBC Bldg., Cleveland 14, Ohio • 225 Moore St., S.E., Atlanta 2, Ga. • Kansas City Merchandise Mart Ing., 2201-5 Grand Ave., Kansas City 8, Mo. • 1440 11th St., Denver 4, Colo. • 4532 South Kolin Ave., Chicago 32, Ill. • 1113 Vine St., Houston 1, Texas • 4501 Santa Fe Ave., Los Angeles 58, Calif. • 95 Market St., Oakland 4, Calif. • 452 Statler Bldg., Boston 16, Mass.

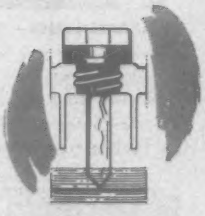


Gould's "Z" Grid is the only completely solid grid. Porosity reduced 85%! 66% more resistant to deterioration!

Regenerative active material. Glass tape and plastic envelope give perfect retention and insulation to "Thirty" Plates.

Here's Why They All Prefer

GOULD-POWERED TRUCKS!



Gould Batteries with Televel Vents show electrolyte level without removal of vent caps. Save time and trouble.

Production, personnel, safety and accounting—*all* prefer Gould-Powered Trucks because they go at full power months after ordinary batteries have begun to slow down. They—

- **Do more work.**
- **Lift, go at same time.**
- **Hug the floor even on high lifts.**
- **Position loads faster.**
- **Are quiet and odorless.**
- **Cut accidents.**
- **Reduce operator fatigue.**
- **Eliminate down-time.**

Power your trucks with

GOULD "THIRTY" BATTERIES

America's Finest Industrial Truck Batteries

GOULD

STORAGE BATTERIES

GOULD-NATIONAL BATTERIES, INC.

Have you a DRILLING problem that Van Dorn DRILLS can solve?

Here's how thousands of plants have used them to speed up jobs!

In MAINTENANCE—The versatile Van Dorn Drill Line gives you hard-working drills for maintenance as well as production. They drive twist drills, wood augers, Hole Saws. And their husky construction stands up under the beating maintenance tools usually take.

In CONSTRUCTION—Whether you're building or modernizing, Van Dorn Drills give you a wide selection. Big, rugged Drills for heavy-duty boring, like this Van Dorn ½" Heavy-Duty model with right angle attachment. Small, compact ¼" models for drilling lead holes in building cabinets, putting up shelves, etc.

In PRODUCTION—Dependable speed, power, stamina, easy handling make Van Dorn Drills the top choice of thousands of production men. The powerful, compact, Van Dorn ¼" HOLGUN* shown here is a sample of the wide range of models and capacities you have to choose from.

WATCH a Van Dorn Drill on the job and you'll see speedy drilling, easy handling, trouble-free running. Examine its engineering and you'll find a powerful Van Dorn-built motor, tailored for the tool; full ball-bearing construction; extra-tough gears, shaft and chuck spindle and husky housing. Check the Van Dorn Drill Line and you'll discover an unmatched choice of 25 models in capacities from ¼" to 1¼" in steel, double in hardwood. A choice of handle arrangements for easiest operation. A choice of speed, power and price in most capacities.

That's why it makes sense to think of Van Dorn Drills first when you're up against a drilling problem. They'll save you time, money and man-hours. And as a *plus*, you get finest service for longer tool life from any one of 29 Van Dorn-owned-and-operated Factory Service Branches. See your nearby Van Dorn Distributor for thorough demonstrations. Write for free catalog to: THE VAN DORN ELECTRIC TOOL CO., 719 Joppa Road, Towson 4, Md.

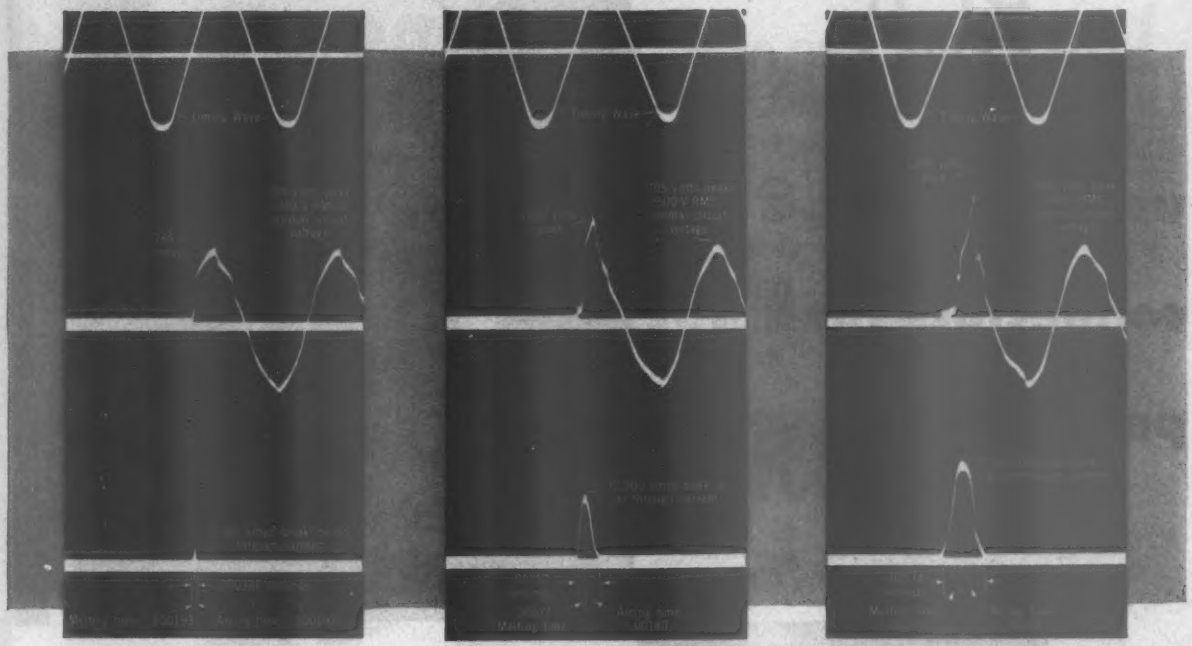
For Power Specify "Van Dorn" Portable Electric TOOLS

(Div. of Black & Decker Mfg. Co.)

*Trade Mark Reg. U. S. Pat. Off.

UNBELIEVABLE

UNTIL THESE CERTIFIED OSCILLOGRAMS SHOW YOU ACTUAL INTERRUPTING TEST RESULTS



30 ampere, 600 volt Shawmut Amp-trap. Available current: 118,000 amps. RMS. 202,000 amps. Peak.

400 ampere, 600 volt Shawmut Amp-trap. Available current: 118,000 amps. RMS. 202,000 amps. Peak.

1000 ampere, 600 volt Shawmut Amp-trap. Available current: 85,000 amps. RMS. 144,000 amps. Peak.

SHAWMUT Amp-trap* CURRENT LIMITERS

...the ultimate in low-voltage circuit protection

These interrupting tests on Amp-traps were successfully performed in a high capacity testing laboratory at 500 volts, 60 cycle, fully offset wave, in accordance with A.I.E.E. Standards #25 on Power Fuses, and were witnessed and certified by Electrical Testing Laboratories.

Never before in electrical history, so far as we know, has any circuit protecting device combined such lightning-fast current limiting and interrupting action. Amp-traps are built in sizes from ¼ ampere to 3000 amperes for application on circuits up to 600 volts A.C. or D.C. Amp-traps' operating temperatures are relatively low.

It will pay you to investigate how the Shawmut Amp-trap design operates without noise or flame. Fill out and send the coupon below, to get proof of amazing Amp-trap performance.

A 1600 ampere Amp-trap mounted in special fuse holders with spring washers — for application on circuits up to 600 volts A. C. or D. C.

*Trade-Mark "Amp-trap" Registered U. S. Patent Office

REGISTERED UNITED STATES PATENT OFFICE

SHAWMUT
CIRCUIT-MATCHED CURRENT LIMITERS

Insure more accurately engineered protection for any circuit

THE CHASE-SHAWMUT COMPANY
381 Merrimac Street, Newburyport, Massachusetts

I am interested in more information about the Shawmut Amp-trap device, particularly for

- ☐ new electrical installations
- ☐ old electrical systems
- ☐ incorporation in such equipment as switchgear, station auxiliary buses, motor starters, bus ducts and cable systems

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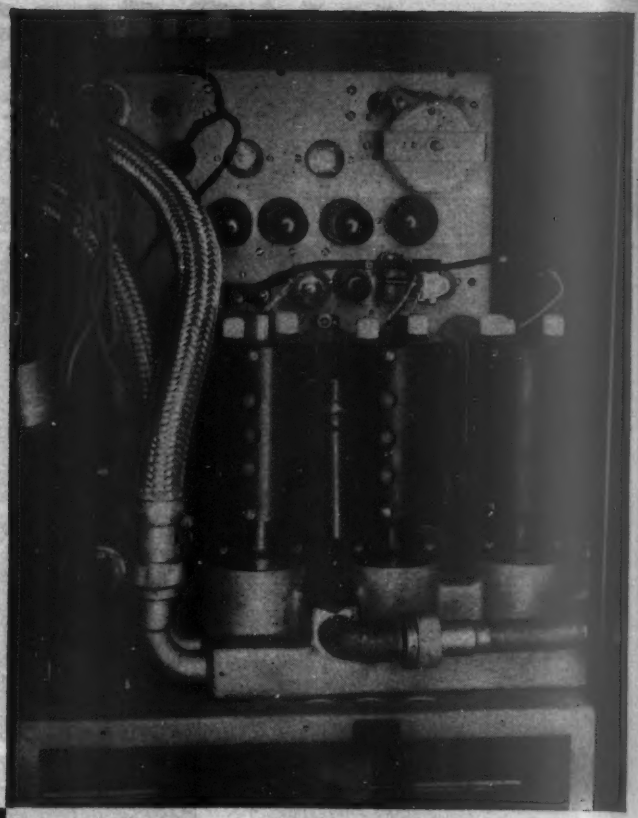
Firm.....

Street.....

City.....Zone.....State.....

☐ Check here for information on C-Q-T, the startling new Plug Fuse with Time-Delay sufficient to start a heavy washing machine, yet sensitive enough to protect lamp cords.

RCA uses flexible connectors for RIGID performance



The famous RCA Electron Microscope enables man to magnify the infinitesimally small on a scale that would make a postage stamp appear the size of a ball park. It does it with a beam of electrons, themselves so small that even a molecule of air may deflect them.

This calls for high vacuum—a vacuum of only 1/10,000,000 of an atmosphere. The connections between the pumps that create this vacuum and the vacuum chamber of the microscope must be flexible for reasons of assembly, minimized vibration and ease of adjustment. So RCA engineers specified seamless flexible metal tubing.

This is a dramatic example of how American Seamless Flexible Metal Hose and Tubing – tight, strong and corrosion resistant – can provide *flexible* connectors for almost any liquid, gas or semi-solid; can connect piping or parts that vibrate, move or are out of alignment.

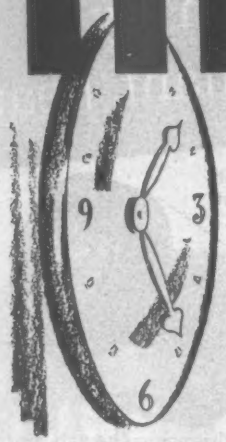
Let our Technical Department help you with your problem. Also, write today for Bulletins SS 50 and CC 300. The American Brass Company, American Metal Hose Branch, Waterbury 20, Connecticut. In Canada: The Canadian Fairbanks-Morse Co., Ltd.

ANACONDA

wherever connectors must move **American**

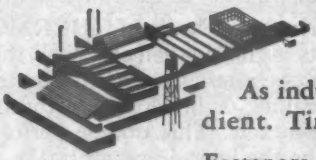
FLEXIBLE METAL HOSE AND TUBING

time our greatest ally!



Let's save it on the assembly line

—beginning now!



As industry gears for defense, *time* is a most precious ingredient. Time to redesign, to retool and, finally, to produce.

Fasteners, as always, will play an important part in forging America's mailed fist. And the fasteners specified on blueprints today will determine whether production hours are saved, or wasted, in the future.

Careful selection of the most efficient fastener for each holding job can save these hours . . . can speed assembly and eliminate time-wasting fumbling. It is important, also, to consider design, tolerances as well as raw material, heat-treatment and finishes when making a fastener selection.

We at Lamson & Sessions will be happy to consult with you on any fastener problem—and recommend the most efficient one for the particular job at hand.

The home of "quality controlled" fasteners

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Multi-purpose THERMOSTAT controls furnace operation by "seeing" radiant heat

Arrow points to THERMOSWITCH unit which controls operation of grate in this modern anthracite home heater.

Developed in the Laboratories of the Anthracite Institute

Outstanding among anthracite home heating equipment, the Axeman-Anderson Anthratube stokes itself automatically, burns up to 38% less fuel than ordinary coal furnaces, and captures over 80% of the coal's usable heat. A feature of its efficient operation is a self-shaking grate, and a basic design-problem was to devise a means of actuating this grate at the proper times for ash removal. Since ash is not formed at a constant rate, timing devices were precluded.

Thermostatic control was indicated, but it was found that when any of various standard thermostats were placed in or near the fire they either could not stand the temperature or were too slow in operation.

The solution was a Fenwal THERMOSWITCH unit, placed about six inches in front of the grate bed, where it responds by "seeing" the radiant heat from the fire bed. When ash collects, the THERMOSWITCH control can no longer "see" the fire and, therefore, the shell temperature drops, closing the operating circuits, causing the grate to move forward and back, dumping the ash, until the fire is again "visible" to the control.

The activating element of THERMOSWITCH thermostats is the single-metal shell that expands or contracts *instantaneously* with temperature changes, making or breaking the totally enclosed electrical contacts. This unique performance has proved to be the logical answer to the widest variety of control problems.

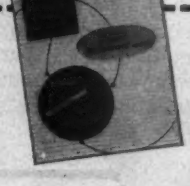
It may be *your* answer. Why not send for further interesting facts that will help you decide. Mail the coupon today!

Fenwal

THERMOSWITCH

The Precision Multi-Purpose Thermostat Control

SENSITIVE . . . but only to heat



FREE! Get this bulletin . . . see what Fenwal THERMOSWITCH units can do for you. *Just fill in coupon and mail . . . no obligation.*

FENWAL, INCORPORATED, 63 Pleasant St., Ashland, Mass.
111 South Burlington Ave., Los Angeles 4, Cal.
TEMPERATURE CONTROL ENGINEERS

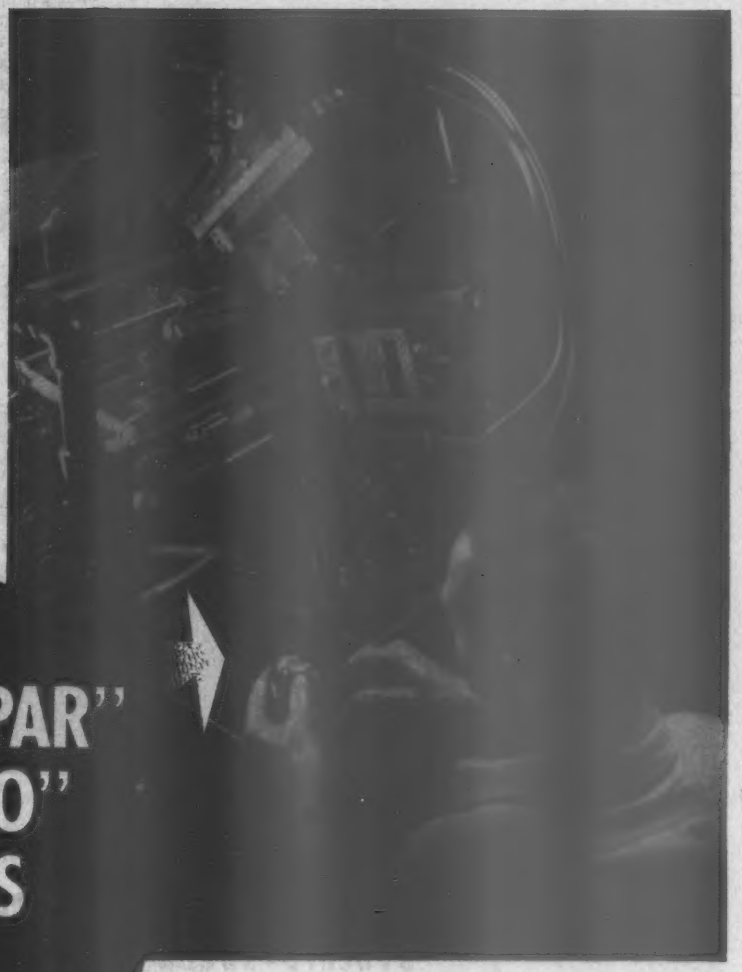
Name ..... Position .....
Company .....
Street .....
City ..... Zone ..... State .....

I am chiefly interested in the applications checked:

- ☐ Heating
- ☐ Cooling
- ☐ Humidity Control or Detection
- ☐ Alarm (over-temperature, under-temperature)
- ☐ Vapor Level Control
- ☐ Timing (thermal)
- ☐ Radiant Heat Control
- ☐ Pressure Control (by controlling vapor temperature)

OTHER (Please fill in your special requirements) .....
.....
.....

Up to 35% greater production, much longer tool life



with GULF "LASUPAR" and "ELECTRO" CUTTING OILS

These new improved Gulf sulphurized cutting oils contain sulphur combined by a special Gulf Process so that it is extremely active over the entire range of a cutting operation. That's the important reason why users are able to step up feeds and speeds on tough machining jobs. They report production increases of as much as 35% after switching from conventional oils of this type.

Gulf Lasupar and Electro Cutting Oils provide excellent protection for the tool at elevated production rates—help reduce built-up edge, prevent chip welding, prolong tool life.

Because Gulf Electro Cutting Oil contains a larger percentage of this extremely active sulphur ingredient, it is recommended for the toughest machining jobs, where production and tool life are a problem.

Gulf Lasupar Cutting Oil also contains stable sulphurized fatty oil, effective in producing the fine finishes for which this quality cutting oil is so well known.

Operators everywhere welcome the new Gulf Lasupar and Electro Cutting Oils—because they get all these production advantages without the disagreeable odor ordinarily associated with sulphurized cutting oils.

Call in a Gulf Lubrication Engineer today and arrange to use these outstanding oils in your shop. Or send the coupon below for additional information.

FIFTY YEARS OF SERVICE
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PETROLEUM AND ITS PRODUCTS

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Please send me, without obligation, a copy of each of your new pamphlets "Gulf Lasupar Cutting Oil," "Gulf Electro Cutting Oil."

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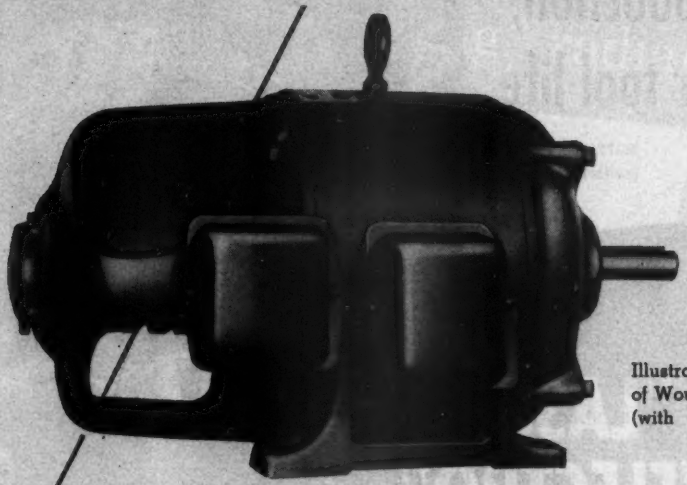
WOUND ROTOR MACHINES

Are Available for *MANY* Industrial Uses . . .



Illustrating Century Line of Wound Rotor Machines (with covers).

For

Compressors • Cranes • Hoists • Bending Rolls • Refrigerators • Bridges • Synchro-Speed Drives • Printing Presses • High Frequency Current

Century Polyphase Wound Rotor machines are adaptable to many applications that require

1. Adjustable varying speeds or reversing direction of rotation — such as bending rolls, fans and blowers, newspaper printing presses, etc.
2. Synchro-speed, multiple drives to be used when two or more industrial operations must be synchronized.
3. Converters — to supply high frequency current for high speed electric motor-driven machines and hand tools.
4. High starting torque with low starting current — for such applications as cranes, hoists, lift bridges, turn tables and car dumps.

Century Electric Wound Rotor Machines are built in sizes up to 400 horsepower and are available in open protected or splash proof frames.

Century builds a complete line of electric motors in a wide range of types and kinds, in sizes from 1/6 to 400 horsepower.

Century C MOTORS

Specify Century motors for all your electric power requirements.

Century Electric Company is celebrating its 50th year in the electrical industry.

CENTURY ELECTRIC COMPANY • 1806 Pine St. • St. Louis 3, Mo.

Offices and Stock Points in Principal Cities

CE-603

These Fenestra Windows in the American Woolen Co., Lawrence, Mass., were commercially hot-dip galvanized and installed in 1922. They are still in fine shape.

NOW MADE EVEN MORE DURABLE!

Over the long years you've seen the loyal performance of Fenestra* Steel Windows. You've seen the ruggedness of fine steel minimize most maintenance . . . the strength and rigidity stand up under years of use. You've seen the fine protection that commercial galvanizing gives steel.

And now Fenestra's *special* galvanizing makes Fenestra Windows even *more* durable.

We call it *special* galvanizing because it's unobtainable anywhere else. Fenestra engineers developed a galvanizing system specifically for Steel Windows and built a special plant around it.

THE REAL SECRET

The real secret of the system is that Fenestra galvanizing is an integral part of the *manufacturing process.*

So get steel-strong windows made to *stay* new—get Fenestra Galvanized Steel Windows. For further information, call your Fenestra Representative (he's listed in the yellow pages of your phone book). Detroit Steel Products Company, Dept. FM-3, 2266 East Grand Boulevard, Detroit 11, Michigan.

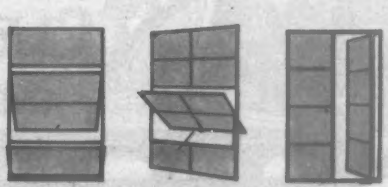
Fenestra's New Hot-Dip Galvanizing Process

1. **Specially Fabricated Parts.** To insure proper galvanizing, fabrication and assembly of window parts are especially engineered.
2. **Hot, Deep-Dip Galvanizing.** Windows are cleaned, rinsed, fluxed, then *completely* immersed in a bath of molten zinc.
3. **Bonderized Finish.** For a perfect finish, windows are Bonderized, then rinsed. Also provides excellent base for paint finish when desired. .

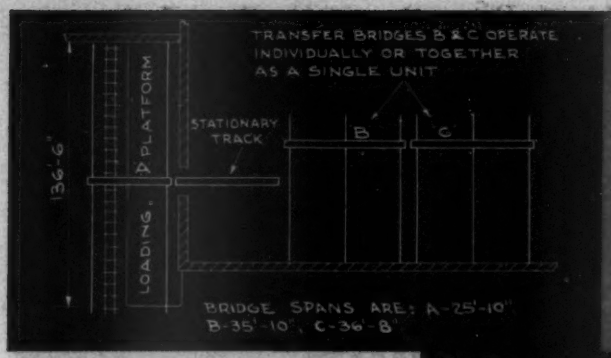
Steel-Strong Windows made to STAY new

Fenestra

HOT-DIP GALVANIZED STEEL WINDOWS



Intermediate Industrial Residence



5 TON TRANSFER BRIDGE SYSTEM with Advanced Features

(At right) The two inside bridges are shown interlocked and being operated as a single unit. Either bridge may be operated individually. All control is centralized in the push button station suspended from the carrier.

(Below) The outside bridge serving the loading dock interlocks with inside track at doorway.

CASTINGS can be picked up at any point in the large shipping room, and loaded onto railroad cars or trucks at the outside of the building with this efficient 5-ton transfer bridge system. The bridges and stationary track interlock, enabling the motor-driven carrier to operate on any bridge.

The two inside bridges can be operated individually or together as a single unit, and controlled completely by means of the pendant push-button station on the carrier. This permits operating the bridges separately for local work in the bays each covers. When transporting materials from one bay to the other, time is saved by operating the bridges interlocked as a single unit because then it is not necessary to travel the bridges extra distances in order to interlock them for transfer of a carrier.

There is no end to the ways in which Cleveland Tramrail equipment can be adapted to serve industry's needs. What is your problem?

GET THIS BOOK!
BOOKLET No. 2008. Packed with valuable information. Profusely illustrated. Write for free copy

CLEVELAND TRAMRAIL DIVISION
THE CLEVELAND CRANE & ENGINEERING CO.
3201 EAST 284th STREET, WICKLIFFE, OHIO

CLEVELAND TRAMRAIL
OVERHEAD MATERIALS HANDLING EQUIPMENT

AIR CYLINDERS

SOLID STEEL HEADS, CAPS and MOUNTINGS. **Eliminate dangerous, costly breakage under even the severest operating conditions . . . assuring longest possible cylinder life. Standard construction on ALL Miller Cylinders—*both Air and Hydraulic.***

HARD CHROME PLATED PISTON RODS. **90,000 to 110,000 psi yield point heat treated stress relieved steel, accurately ground, polished, then hard chrome plated for extra high resistance to the scratches that commonly cause leakage.**

DIRT WIPERS. **Wipe piston rods clean on every "in" stroke, protecting piston rods, seals, and bushings from scratch-damage by dirt, scum, abrasive particles. Standard construction on ALL Miller Cylinders — *both Air and Hydraulic.***

NON-CORROSIVE BRASS BARRELS. **Eliminate the rust and corrosion caused by moisture always prevalent in plant air lines. Standard construction on all Miller Air Cylinders.**

Write for illustrated cylinder bulletins A-105 and H-104

COMPLETE MILLER CYLINDER LINE INCLUDES. AIR CYLINDERS, 1½" to 20" BORES, 200 PSI OPERATION; LOW PRESSURE HYDRAULIC CYLINDERS, 1½" TO 6" BORES FOR 500 PSI OPERATION, 8" TO 14" BORES FOR 250 PSI; HIGH PRESSURE HYDRAULIC CYLINDERS, 1½" TO 12" BORES. 2000-3000 PSI OPERATION. ALL MOUNTING STYLES AVAILABLE.

MILLER MOTOR COMPANY

4033 N. KEDZIE AVENUE, CHICAGO, ILLINOIS

AIR AND HYDRAULIC CYLINDERS · ACCUMULATORS · COUNTERBALANCE CYLINDERS · BOOSTERS · AIR HOISTS

CLEVELAND — PITTSBURGH — PHILADELPHIA — DETROIT — YOUNGSTOWN — BOSTON HARTFORD — NEW YORK CITY — DAYTON — ST. PAUL — FORT WAYNE — INDIANAPOLIS MILWAUKEE — NASHVILLE — SEATTLE — LOS ANGELES — SAN FRANCISCO — BALTIMORE ST. LOUIS and OTHER AREAS.

les and Service from coast to coast

THE TOOLROOM BEHIND THE ASSEMBLY LINE

—facts about maintenance of Keller Air Tools

Back of every assembly line is the department responsible for tool maintenance. Workmen there can tell you about the parts that must be carried in stock, and the frequency with which screw drivers, nut setters, and other assembly tools come back for service.

Experienced toolroom men say that Keller Air Tools come back less frequently, because they are designed for extreme simplicity and fewer parts.

They also say that when Keller Tools *do* come back, service is comparatively easy because the tools are so easy to take down and reassemble.

Wide interchangeability of parts in Keller tools materially reduces parts inventory requirements, and makes it easy to adapt tools from one job to another.

A Keller sales engineer will gladly analyze your tool requirements and help you "Kellerize" your assembly line.

Keller pneumatic pickup screw driver in parts assembling

Keller Screw Driver used to assemble circuit breakers

Keller Nut Setter used in assembling electric controls

KELLER

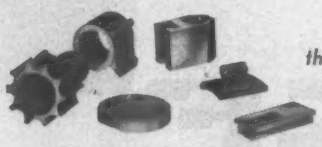
Pneumatic Tools

KELLER TOOL COMPANY, GRAND HAVEN, MICH.

OILITE may relieve your shortage of critical materials

Particularly in mass-production units of small and medium size, Oilite finished machine parts and bearings can be made to your design in a broad range of ferrous and nonferrous metals and alloys, except as limited by government control. Moreover, Oilite products of ferrous base may serve excellently instead of scarce nonferrous units or as replacements for steel and castings.

When you employ Oilite you also obtain the benefits of more than 20 years' engineering, research, and production experience in powder metallurgy, together with the service of field engineers throughout the United States and Canada.



You are invited to contact the field engineer in your district or write the home office regarding the application to your needs of Oilite products.

A Note to Executives

Oilite is an effective replacement, not a mere substitute

In the last decade, more and more executives have become "Oilite minded" because the advantages are many. To meet the current situation, many of our customers have changed their specifications to replace strategic copper and tin with products of iron powder or iron powder alloys. Others are replacing iron castings, steel and aluminum with similar Oilite products.

Also of importance to executives, under conditions of urgency, are the wide adaptability, the speed of delivery, and the economy of cost, time and manpower which result from the use of Oilite finished machine parts, made from metal powders.

Intricate designs, which normally require many different machining operations, can be produced quickly and economically from Oilite. There is great freedom of design and frequently two or more parts can be combined in a single Oilite unit. Oilite eliminates up to 24 machining operations.

Delivered ready for assembly, Oilite parts save the time and investment required to tool up by standard methods. It is not unusual to be in production on a complex Oilite part within a few weeks, as compared to a possible 18-month delivery of machine tools. Trained manpower is thus released for other urgent needs.

Oilite is not a substitute. It is metallurgy's answer to the need for a new material. It may solve your problem.

President

AMPLEX MANUFACTURING COMPANY

Subsidiary of Chrysler Corporation

DETROIT 31, MICHIGAN

Field Engineers and Supply Depots in Principal U. S. and Canadian Cities

OILITE PRODUCTS

Heavy duty, oil-cushioned, self-lubricating bearings and finished machine parts in ferrous and nonferrous metals and alloys. Permanent filters. Friction units. Self-lubricating cored and bar stock.

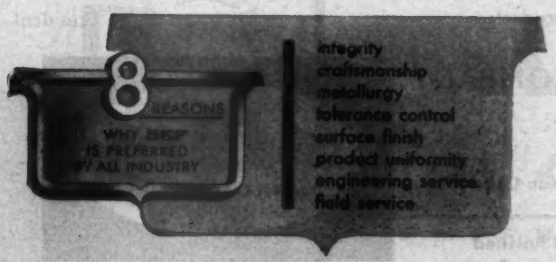
OILITE
PRODUCTS

SKF Distributor Salesmen's Educational Program Passes HALF-WAY Mark

Your SKF Bearing Distributor's salesmen are half-way through their refresher course that's turning them into qualified anti-friction experts. They've followed the course faithfully. They're already worth more to you because they know more about your anti-friction problems.

When you need replacement bearings, be sure you consult your SKF Distributor *first*. He's now better qualified than ever to answer your anti-friction questions more intelligently, more efficiently, more economically.

7209



SKF

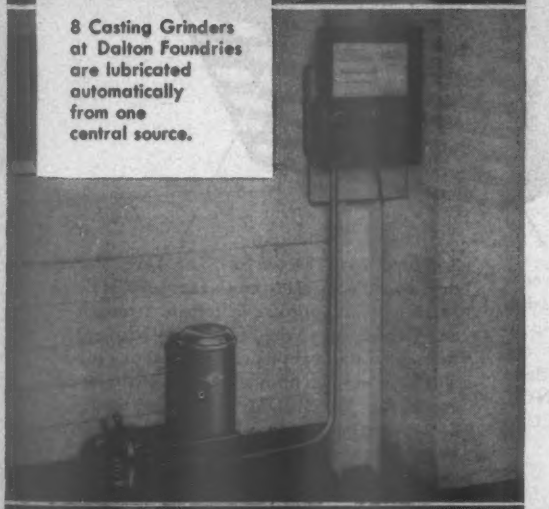
BALL AND ROLLER BEARINGS

SKF INDUSTRIES, INC., PHILADELPHIA 32, PA.
—manufacturers of SKF *and* HESS-BRIGHT *bearings.*

"More Than

Lincoln's CENTRALIZED LUBRICATION..."

8 Casting Grinders at Dalton Foundries are lubricated automatically from one central source.



"Upon checking with our maintenance department, we find them quite enthusiastic over the results obtained from the Lincoln Centralized Lubrication System now installed on our grinders.

"While we have no exact figures for comparison, we believe that we have reduced our bearing trouble by at least 60% and have, undoubtedly, cut down lubricant usage. Of course, down-time for maintenance has been reduced in line with the 60% reduction in bearing trouble. We can, without reservation, recommend this method for use in other foundries."

C. H. Ker, Vice Pres.
The Dalton Foundries, Inc.,
Warsaw, Indiana

On Old or New Equipment, *Lincoln's* Centralized Lubrication Systems

Apply the RIGHT Lubricant
in the RIGHT Quantity
at the RIGHT Time

Lincoln's lubrication system specialists will work with you and recommend the time and money saving Centralized Lubrication System best suited to your equipment.

SEE OUR CATALOG IN SWEET'S

LINCOLN ENGINEERING COMPANY
5731 Natural Bridge Ave., St. Louis 20, Mo.

For Greater Strength and Shock Resistance

"Look Under the Hood" of a BULL DOG V-BELT!

BWH

DEPENDABLE RUGGEDNESS

Industrial V-Belts in A, B, C, D and E sections —full range of lengths from 26"-660"

1. The covers of BULL DOG V-BELTS . . . as durable as they are with their plies of closely woven, bias cut fabric represent only part of the BULL DOG story behind the long life and outstanding performance of these belts. That's why we say "Look under the hood!"

2. Immediately beneath the cover is the BWH-developed compression section of fabric and quality-controlled compounds. This is the basic reason why Bull Dog V-Belts *both* run cooler and DO NOT CRACK OR DETERIORATE UNDER SEVERE FLEXING.

3. Third basic factor in Bull Dog V-Belt quality is the specially engineered BWH Cord Section — exceptional in tensile strength — and the answer to the belt's heavy load carrying capacity and ability to absorb shock loads. Thank a new technique in processing these cords for MINIMUM STRETCH and the advantages of fewer adjustments, less slippage, longer belt life.

Put V-Belt problems behind you — ask your BWH distributor for a set of Bull Dogs. Do it as soon as you can!

TOUGH PROBLEMS INVITED — Don't hesitate to ask us or your nearest BWH distributor about your power transmission belting, conveyor belting and hose problems. We're specialists in making mechanical rubber products work *better, longer.*

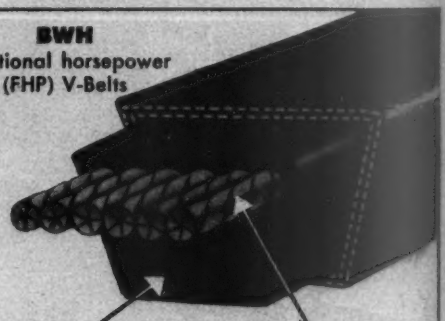
Another Quality Product of

BOSTON WOVEN HOSE & RUBBER COMPANY

Distributors in all Principal Cities

PLANT: CAMBRIDGE, MASS. • P. O. BOX 1071, BOSTON 3, MASS., U.S.A.

BWH
Fractional horsepower (FHP) V-Belts



COMPRESSION SECTION, engineered to withstand continual flexing.

BULL DOG CORDS, comprise a powerful, load-carrying section.

On big jobs or little ones it pays to take advantage of Master's unusual ability to supply the RIGHT horsepower, the RIGHT shaft speed, the RIGHT construction features, the RIGHT mounting . . . all combined into one compact power package.

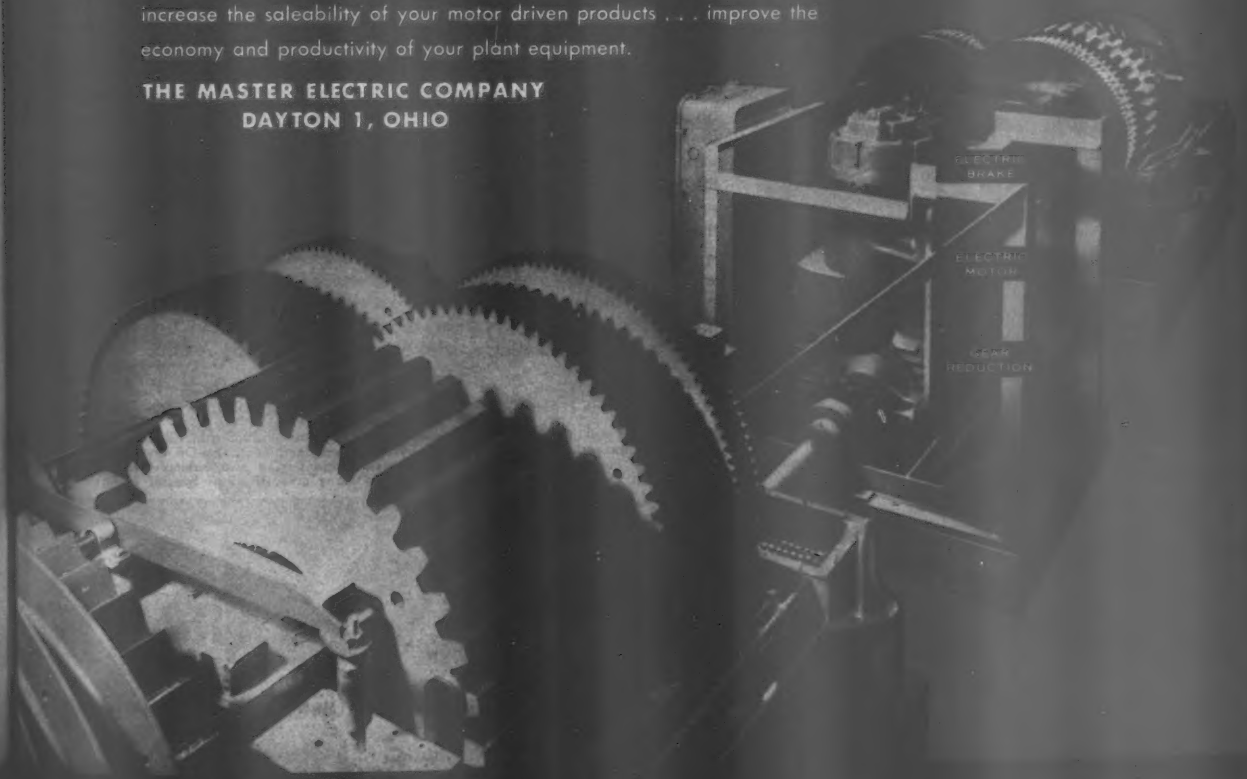
Don't put up with make-shift assemblies when you too may be enjoying these advantages. Master Motors, available in thousands and thousands of types and ratings (up to 150 HP) give you a selection you can get nowhere else.

Open, enclosed, splash proof, fan-cooled, explosion proof . . . horizontal or vertical . . . for all phases, voltages and frequencies . . . in single speed, multi-speed and variable speed types . . . with or without flanges or other special features . . . with 5 types of gear reduction up to 432 to 1 ratio . . . with electric brakes . . . with mechanical variable speed units . . . and for every type of mounting . . . Master has them all and so can be completely impartial in helping you select the one best motor drive for YOU.

Select the RIGHT power drive from Master's broad line and you can increase the saleability of your motor driven products . . . improve the economy and productivity of your plant equipment.

THE MASTER ELECTRIC COMPANY
DAYTON 1, OHIO

BIG ones



COMPLETE SYSTEMS

for ENAMEL • LACQUER • PAINT

Two Mahon Gas-Fired Dry-Off Ovens which bodies enter immediately following wet sanding and rinse operations.

. . . the EXPERIENCE that goes into the PLANNING and ENGINEERING of MAHON EQUIPMENT is the item of GREATEST VALUE to YOU!

Tack-Off Booth at entrance to Two-Tone and Repair Spray Booth. Filtered Air is supplied to this Tack-Off Booth and is maintained at slight pressure to exclude factory dust.

Cooling Tunnels at exit end of Dry-Off Ovens saves floor space, exhaust excessive heat otherwise radiated within the plant.

Mahon Direct Gas-Fired, Tunnel Type Finish Baking Oven with Cooling Tunnel at exit end partially exposed.

MODERN MAHON FINISHING EQUIPMENT Will Do A Better Job of Finishing for YOU Too!

Progressive manufacturers today insists on modern Mahon Finishing Equipment . . . they pay a little more for the many new features engineered into these systems to reduce maintenance, provide better working conditions, and produce finer finishes at lower cost. Illustrated here are some of the major units of equipment in a complete Mahon finishing system specially designed to process automobile bodies. This system comprises two complete finishing production lines and an additional two-tone and repair line . . . some of the innovations include an elaborate air supply and distribution system, "Hydraire" flood sheets, for more efficient control of air flow within the down-draft spray booths, automatic sludge segregators and unloaders to eliminate the necessity for extensive periodic cleaning, cooling tunnels at exit ends of drying and baking ovens to conserve floor space and exhaust the excessive heat which the hot bodies would otherwise radiate within the plant. When you are in need of new finishing equipment it will pay you to take advantage of the experience and the wealth of technical knowledge and practical know-how accumulated by Mahon engineers in thirty years of leadership in this field. See Mahon's Insert in Sweet's Mech. Ind. File, or write for Catalog A-650.

THE R. C. MAHON COMPANY

HOME OFFICE and PLANT, Detroit 34, Mich. • WESTERN SALES DIVISION, Chicago 4, Ill.

Engineers and Manufacturers of Complete Finishing Systems—Including Metal Cleaning and Pickling Equipment, Metal Cleaning and Rust Proofing Equipment, Dry-Off Ovens, Hydra-Filter Spray Booths, Filtered Air Supply Systems, and Drying and Baking Ovens; Core Ovens, Dust Collecting Systems, Fog-Filters, and many other Units of Special Equipment.

MAHON

He's your biggest investment

improve your employee's efficiency for better production

G-E Industrial Electronics Training Course offers information on all phases of industrial electronics in twelve lessons, written and produced under the supervision of General Electric Industrial Electronic Specialists. A complete set of training material—instructor's manual, 10 sets of review books (12 to a set), 12 records, and 12 film slides cover such subjects as "Fundamentals of Electricity," "Photoelectric Relay Systems," "Grid Control of Electronic Tubes" and others. Simple explanations take away the mystery of electronic equipment, and enable trainees to understand circuits and diagrams quickly and easily. They will help you to better utilize the electronic equipment you now have or will get. As one user of the More Power to America program reports, "The course has been shown to engineers, and instrument and electrical craftsmen . . . created an interest in more information about electronic equipment, and where there is more knowledge there is more application."

NOW $150

It's a good buy . . . Fill in the coupon, attach check, and send it to the nearest General Electric office or to the address on the coupon.

Extra sets of review books . . $3.00 ea.

Extra instructor's manuals . . . . . $3.00 ea.

APPARATUS DEPARTMENT
SECTION L VISUAL EDUCATION DIVISION
GENERAL ELECTRIC COMPANY, SCHENECTADY, N. Y.

Enclosed is my check for $150.00 covering the cost of the Electronics Training Course. I understand this includes the entire kit containing records, slide films, review booklets, and instructor's guide.

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COMPANY.....

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CITY..... STATE.....

GENERAL ELECTRIC

685-35

COMPARISON PROVES the VALUE of VEELOS

the Adjustable V-Belt...

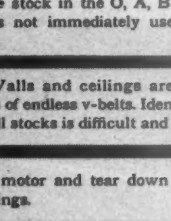
IF you use v-belts you'll be interested in this clear statement of facts about VEELOS, the link v-belt; and endless v-belts.

These 4 reels of Veelos provide up to 316 standard v-belt sizes.

COMPARISON TABLE
VEELOS and ENDLESS V-BELTS

Veelos V-Belts	Endless V-Belts
Any length can be provided for *any* v-belt drive due to link construction.	Standard or special lengths must be supplied for *individual* drives.
MINIMUM INVENTORY. 4 reels can care for every v-belt need in the O, A, B and C widths. No deterioration or obsolescence of spare belts.	LARGE INVENTORY. 316 sizes are required to provide a *complete* stock in the O, A, B and C widths. Spare belts not immediately used will age and deteriorate.
SMALL SPACE. It takes less than 2 square feet of wall or floor space to store 4 reels of easily identified Veelos.	LARGE SPACE. Walls and ceilings are often covered with stocks of endless v-belts. Identifying and maintaining full stocks is difficult and costly.
Installs quickly *on any drive* without resetting motor or tearing down outboard bearings.	Necessary to reset motor and tear down drives with outboard bearings.
Belts can be adjusted or replaced without moving the motor.	Sliding or pivoted motor bases are necessary to replace endless v-belts. Belts cannot be adjusted individually.
Full power delivery can be maintained because the tension of each belt in a matched set is kept uniform by removing or adding links.	Individual belts cannot be adjusted to maintain uniform tension and provide full power delivery.
No limitations are imposed by belt length.	Limited by the availability of standard or special belt lengths.

If you would like to learn more about Veelos—how it can save you money and keep your machines producing—write today for your copy of the Veelos Data Book. It's free and full of facts!



MANHEIM MANUFACTURING & BELTING COMPANY
MANHEIM, PENNSYLVANIA

VEELOS
THE LINK
V-BELT

... ADJUSTABLE TO ANY LENGTH ... ADAPTABLE TO ANY DRIVE

Made in all widths in three types: regular, oil-proof and static conducting. Also double V in A and B. Packaged on reels in 100-foot lengths. Sales engineers in principal cities; over 350 distributors throughout the country. VEELOS is known as VEELINK outside the United States.

Built & Powered to Produce **MORE CHIPS PER TOOL**
MORE PIECES PER HOUR
MORE PROFIT PER JOB than any other turret lathe of comparable size

Jones & Lamson offers the best investment in turret lathes. They are backed by the "know how" of a firm, long predominant in the field, whose many pioneered and perfected developments have brought about far-reaching advances in the art of cutting metal.

Every feature of these lathes has been developed through long-range research and practical experience in production turning. Their superior performance stands out over any other machine of comparable size, because they are built to hold their accuracy at the highest speeds and feeds possible with modern cutting tools — with ample reserves to anticipate new cutting techniques. Jones & Lamson Turret Lathes have a well-earned reputation for ease of operation, low operating costs and year-round dependability. They are recognized for their advantages in *SPEED, POWER, RIGIDITY AND REPETITIVE ACCURACY.*

They will pay for themselves quickly through savings in direct costs alone!

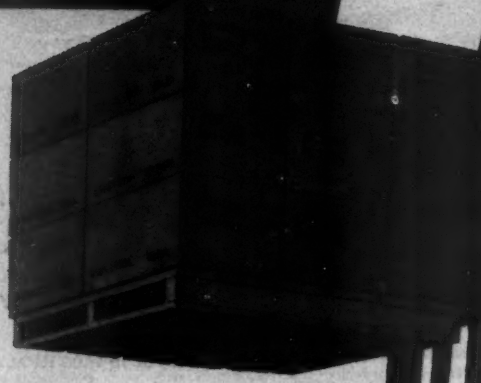
- Single lever speed selector — 12 spindle speeds 30 to 1500 RPM or 20 to 1000 RPM
- 15 HP constant speed motor — ample horsepower available at all speeds
- Single lever carriage feed selector — 9 reversible longitudinal and 9 cross feeds
- Single lever hexagon turret feed selector — 9 longitudinal turret feeds
- All longitudinal and cross feeds automatically disengaged against positive stops
- Heavy-duty spindle mounting with rugged preloaded anti-friction bearings
- Heat-treated, precision-finished, long-wearing alloy steel gears
- Multiple-disc type forward and reverse clutches — automatic spindle brake
- Husky, multiple-spline transmission shafts with anti-friction bearings
- Hardened and precision ground steel ways — 12½" in overall width
- Bridge-type carriage for multiple tooling at rear of cross slide
- 4-position, quick-indexing square turret — all faces tapped for extra tool blocks
- Hexagon turret clamped automatically on forward stroke of ram
- Automatic lubrication system with forced feed to all sliding bearings
- Complete coolant system — automatic internal delivery to each hexagon turret face
- Adjustable graduated handwheel dials and clips and chrome plated handwheels, dials and levers

Write to Dept. 710 for Complete Information

Turret Lathe Division **JONES & LAMSON** MACHINE COMPANY
Springfield, Vermont, U.S.A.
MACHINE TOOL CRAFTSMEN SINCE 1835

Constant "STOPS AND STARTS" knock out ordinary gas trucks

Constant stop-start operation in industrial trucks means costly operation. Clutch, tires, engine, power transmission parts — and even the driver — are too quickly worn out. Replacement costs mount and trucks lose time on the job. There is *one way* to lick this problem—it's Fluid Drive, the famous cushioned power transmission used exclusively in the new YALE Fork Lift Gas Trucks!



Only YALE has FLUID DRIVE to solve Stop-and-Start problem

See how YALE Fluid Drive can save you money on all materials handling jobs. You get smooth stops, smooth starts, steady floating power at any speed . . . under a *full load* . . . on the level . . . on *steep ramps*. The clutch lasts 3 to 6 times longer. You can operate easily in close quarters — increase storage space, reduce load breakage and driver fatigue.

And only the new YALE can smooth out your materials handling with these other exclusive features

Heavy duty hypoid gearing! 65HP all-weather engine! Shockless steering! Automotive hydraulic brakes! Cold drawn precision aligned uprights! These parts — every vital part, in fact — have been selected, tested and *proved* for their ability to give you more work for your money. Let us show you exactly *how much more!* Write for all the facts today.

Capacities up to 10,000 pounds

YALE is the registered trademark of The Yale & Towne Manufacturing Co.

THE YALE & TOWNE MFG. CO.
Department 33
Roosevelt Boulevard & Haldeman Avenue,
Philadelphia 15, Pa.

I am interested in cutting my materials handling costs.

☐ Please have your local representative call on me.

☐ Please send me FREE detailed literature.

Name_____

Company_____

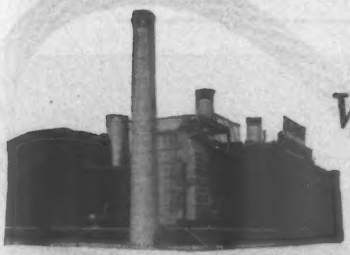
Street_____

City_____ State_____

YALE

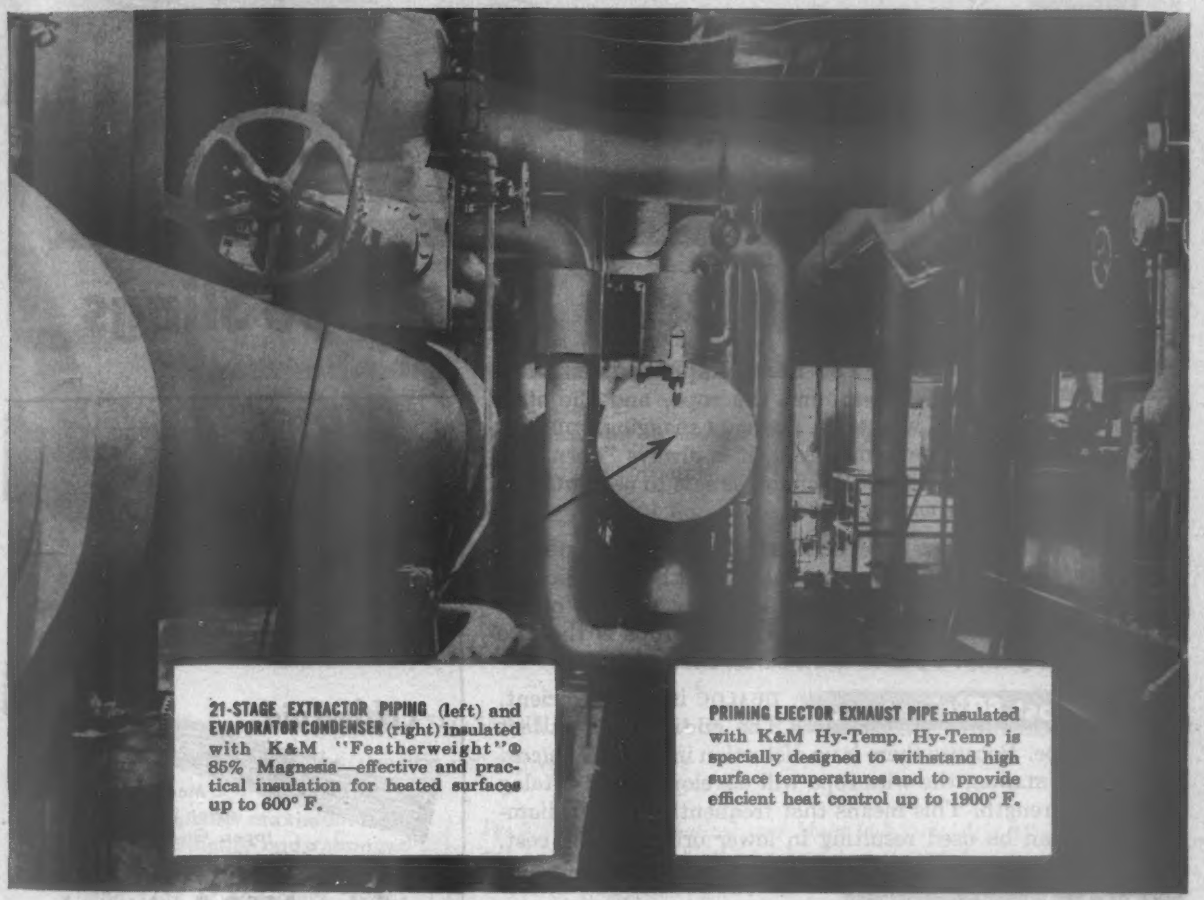
MATERIALS HANDLING DIVISION
Philadelphia 15, Pa.

THE YALE & TOWNE MANUFACTURING COMPANY



Where the best in insulation is a must

Public Service Co. of Oklahoma uses K&M Insulations in Weleetka Power Station



21-STAGE EXTRACTOR PIPING (left) and **EVAPORATOR CONDENSER** (right) insulated with K&M "Featherweight"® 85% Magnesia—effective and practical insulation for heated surfaces up to 600° F.

PRIMING EJECTOR EXHAUST PIPE insulated with K&M Hy-Temp. Hy-Temp is specially designed to withstand high surface temperatures and to provide efficient heat control up to 1900° F.

Insulation Contractor: Armstrong Cork Company

These K&M insulations keep steam hotter—longer—at less cost!

In power stations, oil refineries, chemical plants, factories, steamships, hospitals—in fact, wherever exacting steam control is a must—you'll find K&M "Featherweight" 85% Magnesia and K&M Hy-Temp Insulations. These two K&M products give you highly efficient, cost-cutting insulation in every service temperature range. And, for especially difficult heat control situations, the advantages of both are combined in K&M Hy-Temp Combination Insulation.

Your Keasbey & Mattison Distributor—who is an experienced applicator—will be glad to give you complete information on these or any K&M Insulations. Or, write us.

Nature made Asbestos...
Keasbey & Mattison has made it serve mankind since 1873

K&M best in asbestos

KEASBEY & MATTISON
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ACCO Registered Wire Rope Slings

The Safest . . . The neat wrapping of strands around the rope, and the steel sleeve locked over the wire ends, prevents snagging. DUALOC can be grasped by bare hands. And, it is always "open" for inspection. You can see that the ending is safe to use. DUALOC *is the safest wire rope ending.*

The Surest . . . The DUALOC loop is made of wire rope that has not been unlaid and relaid. It is undisturbed, undistorted. Only the end of the rope is opened. All the strength of the wire rope is there to assure full capacity. DUALOC *is the surest ending.*

The Most Efficient . . . DUALOC is 100% efficient. The ending will outlast the wire rope. Because there is no distortion in ACCO *Registered* WIRE ROPE SLINGS, the wire rope will develop its full catalog breaking strength. This means that frequently smaller diameter rope can be used resulting in lower original sling cost. DUALOC *is the most efficient.*

Added Values . . .

Rated capacities based on 5 to 1 safety factor
Proof-tested at twice the rated capacity
Registered to assure satisfactory service

Standard unit ACCO *Registered* WIRE ROPE SLINGS, made from preformed wire rope, are stocked by leading distributors who will gladly discuss your sling problems. Custom-made slings on special order. Write today for literature.

MEMBER THE NATIONAL SAFETY COUNCIL

Strand-Laid

Made from right regular lay wire rope for general sling use. Equipped with DUALOC.

Cable-Laid

Made by laying up seven individual wire ropes. Gives extreme flexibility. Equipped with DUALOC.

Other ACCO Registered Wire Rope Slings

6-Part Braided. Made from 6 separate wire ropes braided into flat surfaces for greater bearing area.

8-Part Braided. This construction has a symmetrical body which gives all-around flexibility plus great strength.

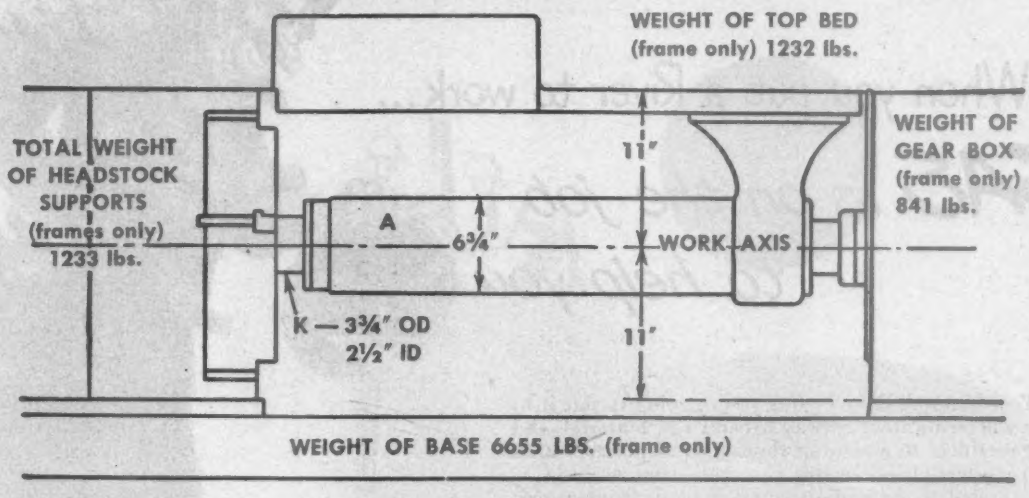
ACCO Wilkes-Barre, Pa., Chicago, Denver, Houston, Los Angeles, New York, Philadelphia, Pittsburgh, San Francisco, Bridgeport, Conn.

AMERICAN CHAIN & CABLE
WIRE ROPE SLING DEPARTMENT

TRADE MARK

In Business for Your Safety

DUALOC "Intentionally Better" WIRE ROPE SLINGS



MAKER OF "HISTORIES"

The above drawing illustrates a Tooling Area that has staged many outstanding cases of machine adaptation and performance. Case histories are very useful as examples of machine adaptation, but their blanket use as unqualified proof of dependable performance is not convincing.

Buyers know that varying requirements and conditions of various plants make "buying what the other fellow buys" an unsafe practice. They know that good case histories will result if machine facilities have been properly selected. No plant could long afford to have it otherwise.

A "top performer" of the 1½" SIX SPINDLE CONOMATIC TOOLING AREA, shown above, is the MAIN END SLIDE. The specific data given tells why:

1. **It has a greater maximum load recommendation and a stronger frame support than the main end slide of any other "automatic".**

The 272 lb. alloy carburized steel Main End Slide, A, is 33⅝" long, and has a maximum load recommendation of 4800 ft. lbs. Its round surface is machined to close limits. It is supported in nickel iron, split, sleeves on the alloy steel Way, K, with a total bearing of 136.9 sq. ins.

2. **It handles more work; has more adaptable tooling positions, and more selective feeds, than the main end slide of any other "automatic".**

The 27⅛" tooling-length of the Slide handles shaft jobs up to 18" in length. The 2⅝" swing clearance permits die-head threading to full machine capacity in any, or all, six positions without Slide alteration. Nine pairs of pick-off gears give 68 feed changes for each work spindle speed.

Buyer's Comparison Chart will guide you to full information

A Comparison of ALL Automatics is in Favor of Cone

Conomatic

CONE AUTOMATIC
MACHINE COMPANY, INC.
WINDSOR, VT., U.S.A.

When you put a River to work...

GAS is on the job to help you

First You Have A River—but you're going to put it to work. It will be a water highway to carry raw materials and finished products to and from thousands of plants within reach of its port cities. In this vast industrial empire Gas will be applied to an endless number of heat-processing operations. But, Gas will also perform countless other tasks to help you put your river to work because—

You Need Towboats—the work-horses of river transportation. As a production-tool in ship building Gas takes over countless jobs—in casting propellers, annealing miles of wire for electric systems, heating billets for diesel-engine shafts, case-hardening gears of speed-reducers. And Gas has other applications—many of them in barge building because you need—

Barges To Carry Your Goods—the giant cargo bottoms which transport so many millions of tons of raw materials and finished products. Glass liners for liquid carriers are the products of Gas—and Gas ovens relieve the stresses in pressure vessels for other chemicals. Structural shapes and plates are cut by Gas, and fabricated after heating by Gas. This essential fuel is vital, also, to—

Your Communications And Navigation—because modern river transportation depends on scientific advances in ship-to-shore telephone and radar. In research, in metallurgical processes, for manufacturing operations, Gas is the most efficient and flexible heating medium, applicable as well—

For Your Production-Processing—in any field. The uses of Gas in turning rivers into water highways only emphasize the diversified tasks in which Gas serves industry. There's always a way to do production-line heating with Gas—economy alone is a good reason why you should consult your Gas Company Representative.

AMERICAN GAS ASSOCIATION

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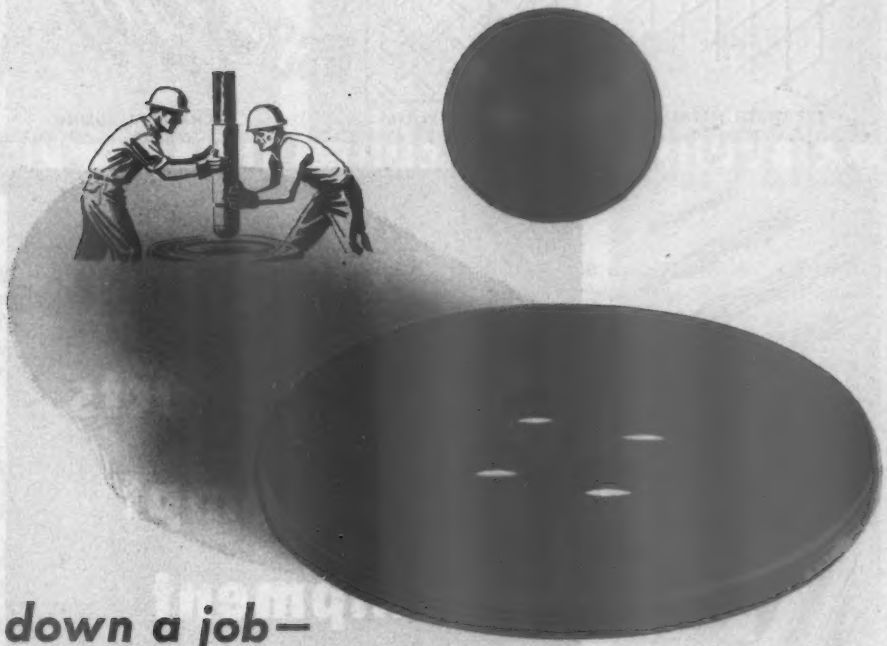
MORE AND MORE...

THE TREND IS TO GAS



How to hold down a job— in a mile deep hole

When the well drillers have "made the hole" and an oil well is about to come in, a new job arises. And it's a real trick to handle, especially since there's a joker in it.

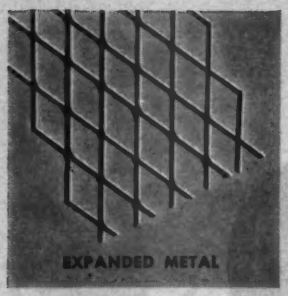
The job is to pump wet concrete into the hole to seal the sides. The joker appears because the shoe through which the concrete is pumped . . . the shoe that prevents the wet mix from backing up in the hole to seal it off . . . cannot be withdrawn after the mix has set.

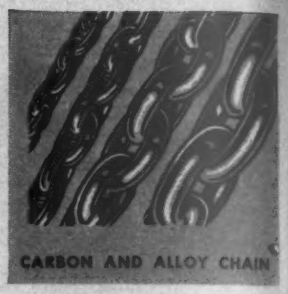
The valve ball and thrust plate of the shoe, illustrated above, must be made from a hard, dense, tough material. They must resist the abrasive action of wet cement under considerable pressure. The ball must be dimensionally stable. Both parts must be moisture resistant. What's more, after the job is complete it must be easy to drill-out the working parts of the shoe to form a passageway.

This is a rare set of requirements. The makers of the Turbo Jet Float Shoe found in Synthane the material to meet them.

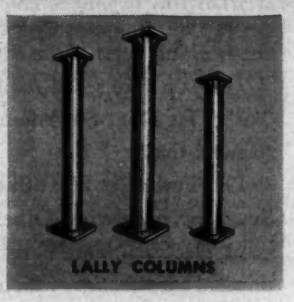
The Turbo Jet Float Shoe takes advantage of several Synthane properties. Other mechanical properties plus good electrical and chemical characteristics form an unusual *combination* which makes Synthane valuable for a wide range of applications. Synthane may be of help to you. To find out, send for the complete Synthane catalog. Address Synthane Corporation, 4 River Road, Oaks, Pa.

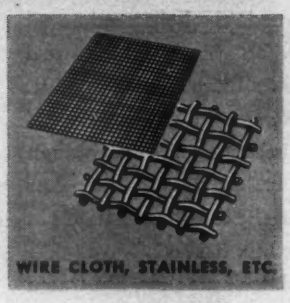
PLASTICS WHERE PLASTICS BELONG **SYNTHANE**





These Steel Products for Prompt Shipment





Did you know that Ryerson is a convenient source not only for many kinds of steel, but also for scores of important related products? All items pictured here are available for prompt shipment in many types and a wide range of sizes. We invite you to call your nearby Ryerson plant.

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RYERSON STEEL

JOSEPH T. RYERSON & SON, INC. STEEL-SERVICE PLANTS AT: NEW YORK • BOSTON • PHILADELPHIA • DETROIT • CINCINNATI CLEVELAND • PITTSBURGH • BUFFALO • CHICAGO • MILWAUKEE • ST. LOUIS • LOS ANGELES • SAN FRANCISCO

1 · How Everyone Can Get Priorities for MAINTENANCE, REPAIR, OPERATING SUPPLIES

YOU CAN NOW WRITE your own DO priority for your maintenance, repair, and operating supply (MRO) requirements. That applies whether you're making military or civilian goods. NPA has authorized *every* manufacturer to apply a "DO-97" rating to his orders for MRO.

The MRO priority has the same weight or value as the DO rating that goes on military and defense orders. It doesn't come behind a DO; suppliers must give it the same kind of handling.

The MRO priority takes precedence over a non-priority order. When it comes to the scramble for really tight supplies, though, the MRO priority—like a military priority—is only a hunting license.

What Supplies Are Covered?

With the new NPA order, you can now use your own DO to get the following supplies:

Maintenance—floor sanders or sweepers, light bulbs and fixtures, paint, batteries and tires for cars and trucks, and other supplies and equipment needed to keep buildings and facilities in operating condition.

Repair—components and parts for all kinds of machinery, including production machinery, materials handling equipment, power equipment, processing equipment, pipe lines and the like.

Operating—dies, jigs, cutting tools, coolants, catalysts, and other supplies and equipment that are used in production, although they don't become part of the product.

Two Important Limitations

1. You can apply DO-97 *only* up to the dollar volume of your MRO purchases in the corresponding quarter of 1950. (Or you can divide your 1950 total by four and use that as your quarterly limit.) It's the dollar amount of *deliveries* that counts, not *orders*.

2. As soon as you use a DO order on any of your MRO purchases, you have to keep all your MRO buying within your quota—even if you don't put a DO on some of the orders.

There's a special exemption for new or small companies. They can apply DO-97 to orders for MRO up to $1000 per quarter, regardless of usage last year.

Minor Capital Additions Covered

There is one major trap in NPA's new MRO order. The man who doesn't see it and avoid it is going to be in serious trouble. It's this:

You are entitled to apply the MRO priority (DO-97) to orders for "minor capital additions"—anything up to $750. But the cost of such additions must be charged against your quota. And your quota is based solely on your 1950 usage of MRO. The fact that you may have made hundreds of "minor capital additions" in 1950 won't add a thin dime to your 1951 quota.

You can't make up the difference by not putting a priority on some of your 1951 MRO purchases. Remember, the minute you use a DO-97 for *any* purpose, all of your 1951 MRO—priority-rated or not—must be charged against your quota.

Of course, you don't have to rate (put a priority on) your minor capital additions. If you don't rate them, you don't have to charge them against the quota. And you can be selective and rate some and not others.

Dangers in Careless Rating

But you can literally commit business suicide by careless rating of capital additions. Suppose after you have rated several minor capital items you find that your remaining quota for MRO is not sufficient. You won't be able to get that MRO, even without a DO-rating. It just won't be legal for you to get that extra MRO.

Your only recourse will be to apply to NPA for an increase in your quota. Even if you get it—and if you have been extravagant in your capital additions it's not at all certain you will—the process will be time-consuming. Even a few days or weeks without MRO supplies flowing into your plant can cause a serious shutdown.

More Relief Coming—Maybe

There's another important order in the works that affects MRO. Right now it looks like this:

Companies producing *repair parts and supplies* will get an exemption from the percentage-cutback provision of NPA's materials-limitations order. For example: Your aluminum use is now limited to 65% of the same period last year. For that portion of your business producing repair parts and supplies, the new order will let you use 100% as much as last year. NPA hopes to be able to apply this order not only to steel, copper, and aluminum but also to such critical materials as cobalt and tungsten.

This order will apply whether you're producing repair parts for industrial machinery or for household vacuum cleaners.

Taken together, these two orders reflect a substantial and basic change on NPA thinking on MRO supplies. They tie right in with the long-pull mobilization thinking we pointed out last month: Sharp cutbacks in *new* consumer goods, to be offset by an all-out effort to keep present equipment operating.

More on next page

2 · HOW TO USE MRO PRIORITIES

Q What is the "MRO order"?

A It is Regulation 4 of the National Production Authority, issued Feb. 27, 1951.

Q What does it do?

It permits you to apply DO (priority) ratings to your orders for maintenance, repair, and operating supplies.

Q Officially, what are "maintenance, repair, and operating supplies"?

A "Maintenance means the minimum upkeep necessary to continue any plant, facility, or equipment in sound working condition.

"Repair means the restoration of any plant, facility, or equipment to sound working condition when it has been rendered unsafe or unfit for service by wear and tear, damage, failure of parts, or the like.

"Neither maintenance nor repair includes improvement . . . by replacing material . . . with material of a new or different kind, quality, or design.

"Operating supplies means . . . any materials which are normally carried as operating supplies according to established accounting practice . . . materials incorporated in a product ordinarily may not be treated as operating supplies."

Q How am I affected as a producer of MRO?

A You can initiate DO ratings for your own MRO requirements. You can extend DO ratings attached to orders you receive for your products. By extending the rating, you can get priority on the materials you need for making the products that become MRO supplies for others.

Q How do I get a DO rating for my MRO needs?

A Within the limitations of the regulation (see below), you simply write on your order to your supplier: "DO-97, certified under NPA Regulation 4."

Q Am I required to apply a DO rating to my MRO?

A No. But if you apply a DO to *any* of your MRO orders, then *all* your MRO orders, whether or not you put a priority on them, must stay within the dollar quotas.

Q What is the "quota" for MRO orders?

A In any calendar quarter, it's the same dollar volume you spent in the average quarter during calendar 1950 (one-fourth of the year's expenditure). If you prefer to operate on a fiscal-year basis, you can use the fiscal year ended nearest Dec. 31, 1950. You should conform to your normal practice—if your fiscal year is purely a convenience for accounting and does not affect your operations, you'd probably do well not to use it for MRO.

Q What's my quota as a seasonal producer?

A You can make it the corresponding quarter of 1950. You're not required to do this. The choice is yours.

Q How do I figure the quota for a branch plant?

A Just as you do for the main operation. But to qualify for a separate quota, you must normally have kept separate MRO records for the branch. The same procedure can be used for a division, department, or other sub-unit of your company.

Q How do I figure a quota for a new unit set up during 1950?

A Add up your MRO expenditures for the time it was in operation and prorate them on a yearly basis. You can make reasonable adjustments for seasonal factors. You figure the same way whether it's a brand-new business or a new unit of an established business.

Q What's the quota for a new unit set up in 1951?

A It's whatever amount you determine to be "reasonable," up to $5000 per quarter. To get a larger quota, you have to apply to NPA for specific adjustment.

Q Is there an exemption for small business?

A Yes. If a company's MRO requirements are less than $1000 per quarter, there is no limitation on his use of DO-97.

Q **Are the quotas based on scheduled deliveries or actual delivery dates?**

A Either, but you must be consistent. You can't handle some of your MRO one way and some the other.

Q **Is there any limit on delivery schedules?**

A You cannot schedule more than your quota for delivery in any quarter, and you cannot schedule more than 40% of the quota for delivery in the first month of the quarter.

Q **Do I have to make any reports to the government on my use of DO-97?**

A If the quota you figure is more than $1000 per quarter, you must notify the National Production Authority of the quota you have set, the base period you used, and the methods by which you figured the quota. You must do this within 30 days of the first time you use a DO-97 to get MRO.

Q **How do I apply for an adjustment of quota?**

A Address a letter, in triplicate, to "National Production Authority, Washington 25, D. C., Ref: Reg. 4." Describe fully the nature of your business, "indicating any seasonal or other unusual features, products made or distributed, or services or other activities performed, the quarterly volume of such business or other activity since Jan. 1, 1950, etc.; state the amount spent for MRO in each quarter since Jan. 1, 1950; specify the amount of increase in quota requested, and set forth in detail the facts and circumstances allegedly justifying such an increase."

No special forms have been prepared for applications for adjustment.

Q **Can I use a DO-97 to purchase "minor capital additions"?**

A Yes. But the cost of this capital addition must be charged against your MRO quota. Be careful to note that you are not permitted to include any of these minor capital additions you made last year in figuring your MRO quota. Using DO-97 too freely for capital additions can put you behind the 8-ball for your MRO purchases.

Q **Officially, what is a "minor capital addition"?**

A "Any improvement or addition carried as capital according to established accounting practice where the total cost of materials used does not exceed $750 for any one complete capital addition."

While you don't have to include labor cost, you do have to include every possible item of material. You can subdivide a capital addition to bring it within the $750 limit, even if part of it is delayed to a later quarter.

3 · WAGE CONTROL GUIDE

Q **Where can I get answers to my wage questions?**

A Ask the nearest office of the Labor Department's Wage-Hour Division. This is an old-line, efficient organization. It has been given the job of interpreting Wage Stabilization Board regulations. It will also answer all wage questions, and process all applications for wage changes. If your problem is outside its jurisdiction, it will be able to refer you to the right source of help.

What it means · The Wage-Hour Division is the same agency that the War Labor Board used during World War II. So you will find many experienced men handling your questions and applications.

You are guaranteed protection, under present rules, if you follow a Wage-Hour ruling in good faith. You won't be held liable if WSB reverses it later.

Q **What happens if I just ignore the regulations—and do as I please?**

A You're in trouble. If you violate the rules, WSB can get Internal Revenue not to allow *any* wages of employees paid at illegal rates as a cost for tax-deduction. This penalty is real. During World War II, the tax people disallowed more than $19-million in wages. There are criminal penalties, too, for willful violations: $10,000 fine and/or one year in jail. Except for second offenders, this is a remote penalty. No employer was prosecuted during the last war for wage violation.

What it means · It doesn't matter whether you deliberately violate the rules, or just didn't know. You can't plead ignorance. Don't forget, too, that Wage-Hour inspectors are available to the WSB. These men have uncanny skill in analyzing payroll data. Get

More on next page

them into your records, and they may clear you on stabilization violations, and then come up with proof that you have slipped on the Wage-Hour Law, or the Walsh-Healey Act.

Q Is it all right to bargain with a union over wages?

A It certainly is. But keep any raise within the bounds of the wage control formula. Then you may put it into effect immediately. Otherwise, you must get prior approval from WSB for any excess. If in doubt, play it safe. Get a ruling from the nearest Wage-Hour office. You will need the ruling, anyhow, if you want price relief. But remember this: You can't be sure of getting price relief. And you must actually be paying the higher wage before OPS will even consider the higher wage as part of your costs. Anticipated higher wage costs don't count at OPS.

What it means • Watch out on this one. The existence of a wage stabilization program doesn't relieve you of the obligation to bargain that's in the Taft-Hartley law. You *must* bargain in good faith with your union. But you don't have to *agree*. Even if you do agree, don't put the raise into effect until you are sure it's OK—regardless of union pressure. If you do, it will be your funeral, not the union's.

Q How do I handle merit increases under WSB rules?

A WSB Regulation 5 is the guide. Briefly, it says you can make merit increases *without* WSB approval under these conditions:

If you have a *formal plan* (spelled out in union contract, for example, or a job evaluation plan with classifications, maximum rates, and written policies), you may follow it. *Check it to be sure.*

If you have a plan, but no set policies on amount or frequency of raises, you're further limited. You can't give anyone more than the *average* raise you granted in 1950 to people in that job classification (or labor grade).

This same rule applies if you don't have a plan at all. But, in addition, you're limited in the *number* of raises you can give—no more per month, proportionately, than you gave monthly in 1950.

In general, you can't raise anyone over the maximum rate for a job classification or labor grade without WSB approval. If you have no maximums, use the highest rate paid for the job on Jan. 25, 1951.

What it means • This brings back a flood of memories of World War II days. As then, you're going to be tied down hard if you don't have an established plan. And you won't be able to use any of these permissible raises as the basis for a price increase, or for resisting a "justifiable" price decrease.

You're going to have to keep careful records, too, to prove your raises were legal. *Start this now.* To get off right, find out from local Wage-Hour people just what form you should use to keep records. The penalty for not keeping the records: $1000 fine or a year in jail, or both.

Your employee relations can be badly hurt if you don't keep workers informed. Be sure they understand you're just obeying WSB rules. Otherwise they'll blame you for using "ghost arguments" to deprive them of raises that are due them. This was a common headache in World War II. It's the kind of thing that's likely to happen again—unless you're careful to explain what you do, and why.

Q What about my own wages—and the wages of other plant operating executives?

A You're no different from shop operators, says the WSB. The same rules apply all the way down the line, and your pay is "stabilized," too. If you have a formal plan governing executive pay, you can follow it without getting WSB approvals. If you don't have a formal plan, follow past practice, as outlined above.

What it means • This arrangement—in part, at least—is temporary. It doesn't make sense to have union members on WSB OK executive salaries. In fact, managements regard executive salaries as confidential, and are not likely to go to WSB until the system is changed. The change is this: A special panel—all public members—will handle executive salary cases. This will be under WSB or the Economic Stabilization Agency. Last time, these cases went to the Treasury Department, but unions complained that the Treasury was more liberal than the War Labor Board. The new plan aims to stop these complaints and keep policies more in line.

Q What about pay adjustments for promotions and transfers, and other routine payroll transactions?

A Regulation 5 also covers promotions, transfers, rates for new and changed jobs, and for newly hired workers. In all cases, you can operate without WSB approval if you obey the rules. Check them.

If you promote or transfer an employee to a higher-level job, you can raise his rate of pay. But the rate can't exceed the rate paid for the new job under your formal plan or past practice. The limitations are the same as for merit raises (see above). Check this, too.

New or changed jobs can't be used as excuses to boost rates. WSB wants such jobs priced so they're in line with other jobs in the existing wage structure.

In hiring new workers, you have to stick to minimum rates unless you can prove the worker is especially well qualified for the job.

What it means • Like merit-raise rules, these make things complicated. WSB is aware that changing jobs and promoting or transferring employees were standard World War II excuses for sneaking through disguised raises. To stay in the clear:

Keep complete records, as required by Wage-Hour.

Be sure workers really go to higher-level jobs if they get raises on promotions or transfers.

Be sure so-called new jobs really are new, and that changed jobs have been changed significantly enough to justify new and higher rates.

Q What effect will stabilization rules have on wage incentive plans?

A If you have a wage incentive plan now, and it was adopted by Jan. 25 and installed by Feb. 9, you don't need WSB approval. You can go on using it, as long as you stay exactly in line with your already established policies and practices. If you're just about to put one in, don't do it until you get approval.

And don't try to set standards for new jobs without checking to see whether it's OK.

What it means · WSB is on the lookout for loopholes here, too. The big one is the World War II practice of steadily loosening up standards to disguise raises. You can be sure Wage-Hour inspectors will be watching for the old practice of using minor changes in methods, materials, or process as the excuse for complete retiming of jobs. The safe play is to retime only the elements that have changed.

Q Where do I stand if I haven't followed autos, steel, and others in giving a general raise in the last few months?

A You'll be able to catch up. The WSB has a new version of the World War II "Little Steel Formula" for that purpose. The aim is to let firms that were frozen before they could raise wages "catch up" with those that got their raises through in time.

The catch-up limit is 10% over what you were paying on Jan. 15, 1950. Stabilizer Johnston plans that increased cost of fringe benefits—such as pensions, health, insurance, better vacations, additional paid holidays—won't be charged against the 10%. However, all fringes are under control and must meet WSB standards before any new ones—or improvements in existing fringes—can be put into effect. *Exception:* If they were agreed to or conform to a contract in effect before Jan. 26. Fringe standards are being formulated.

What it means · Many employers are going to be in for a rude shock on this one. You may have to catch up whether you want to or not—or whether you can afford to or not.

Unions and employees generally aren't likely to be subtle about this. They are going to regard that 10% as "owed" them. It will take plenty of good reasons to bargain out for less. And if you don't have a union, you will find it hard to explain why you can't pay the full amount "owed."

The WSB policy on this whole matter is short-term—aimed to carry through till the end of June. Union representatives are furious over the whole plan, feel it isn't liberal enough. Dispute over this issue has already led to violent WSB upheaval. That's part of "top-level collective bargaining," but it impresses many as "scared-rabbit" tactics on the part of organized labor.

Q What about cost of living raises and deferred wage increases?

A Union contracts in effect Jan. 25 promising cost of living raises or other deferred increases are approved under Johnston's plan—at least through June—even if wages rise more than the 10% catch-up allowance. This approves the General Motors-type "annual improvement" increase of 4 cents due in June, but this boost may not be used as a basis for price relief. That is because it is based on an assumed increase in productivity; thus costs—theoretically—are not raised.

Similar increases for other workers not covered by this type of contract might be approved to correct "inequities." For example, for your white collar workers if you have an escalator contract for shop employees. Or to correct inequities between your workers and others in your industry. But these will have to be approved on a case-by-case basis. To make sure, check with Wage-Hour. Don't assume anything.

What it means · Deferred increases are a big thing. Bureau of Labor Statistics figures show that close to 1.5-million workers got raises last year, and were promised additional raises in 1951 or 1952. Many also got cost-of-living "escalator" clauses, too. When you include office workers and executives to whom employers often also give simultaneous raises, the number is much larger, could easily hit 2-million or more.

Q Is the WSB going to get involved in settling strikes and wage disputes arising out of collective bargaining?

A It certainly is. WSB hasn't any authority yet to rule on wage disputes or strikes. But it will have. There's already been trouble on this score in the meat-packing industry and in textiles. And there's little chance of a no-strike pledge from labor spokesmen, unless we get into all-out war. This makes the need for WSB intervention greater.

The plan is to give WSB authority over disputes as soon as they get to be a real problem. The hope is that Cyrus Ching—soon to go back to the Federal Conciliation Service—will be able to mediate most disputes. Then only the tougher ones will get to WSB.

To do the job, thirteen regional WSB boards are being set up—each made up of representatives of labor, management, and public. When set up, they will handle wage applications—and later disputes, when they get the authority.

What it means · You can't control wages without butting into practically every phase of employer-union-employee relations. Collective bargaining is sure to be tougher than ever, if WSB gets dispute-settling authority. You saw how it went in World War II. The attitude was, "Let it go to the Board—we may get a better break that way." Here's where you begin to see what it really means when you hear it said that the tri-partite WSB idea means substituting collective bargaining high up for bargaining on the local level. WSB may be able to get around this problem, but it's tough. It was never solved in World War II, certainly.

More on next page

4 · CMP TIMETABLE

Circle April 15 on your calendar. It's a Sunday. But it's also the official target date for announcement of the regulations under which CMP (Controlled Materials Plan) will operate starting July 1.

April 15 is also the target date for National Production Authority to release the "L" and "M" orders that will spell out the bad news for producers of nonessential civilian items.

NPA has already issued a series of "M" orders. These limit the percentage of "base period consumption" of a given material that you are permitted. Sometimes they forbid use of a given material in certain end products. (Example: M-12, as now amended, limits March copper usage to 80% of the base period, prohibits use of copper in certain end-items.) The M orders due April 15 will be much stiffer than present regulations.

The "L" orders will limit (or forbid) certain end-items, regardless of whether the M orders would give you enough material to produce them. One reason for such orders is to insure continued production of essentials by preventing flow of available material into relatively high-profit nonessentials. (Example: An L order might prohibit grandfather and mantle clocks, still permit bedside alarm clocks.)

"L" and "M" orders will be the key to success or failure of CMP-1951 *if it actually operates as the "open-end" plan we described last month*: Allotments only for military production and essential supporting activities. Supplies of steel, copper, and aluminum (the controlled materials) not needed for these allotments would become a "free pool" for civilian production. You would scramble for this free pool, get what you can any way you can.

This is the plan being drawn up by the men directly involved with CMP. But there is definite opposition to this plan developing inside NPA. The alternative proposed by the opposition is to "program" all production, including civilian, under CMP.

Here's a run-down of the opposing points of view:

For the open-end plan: Less paperwork, both for industry and for NPA. Smaller staff needed to handle CMP, both by industry and NPA. Manufacturers will have greater flexibility of production if they don't have to "schedule" six months in advance (necessary under 100% CMP). Industry will be free of "bureaucratic domination," able to produce what it wants with materials available to meet consumer demands. "L" and "M" orders will limit overall demand to "something close to a balance" with available materials, thereby eliminate "excessive" competition.

For the 100% plan (which would program civilian production): To be effective, "L" and "M" orders will have to be so tough that a lot of people will yell. So there will be a demand that NPA ease up on the orders. If NPA gives in—as it almost invariably has given in on the relatively mild orders issued to date—demand for "free" materials will far exceed supply. That will put the big company with plenty of money to spend on expediting at a tremendous advantage over the small company. And all companies, small or large, will be faced with an erratic materials supply, resulting in frequent delays, shutdowns, and layoffs. Total production will be less than if all production was programed.

FACTORY's analysis: Advocates of the 100% plan will probably win out, but not right away. There's a practical reason for this: NPA estimates it will have to expand its staff 600% just to handle the "open-end" plan to start in the 3rd quarter. For a 100% plan, a staff expansion of 1000% or more would be necessary. And add to that the fact that NPA's Office of Civilian Requirements is still practically a one-man operation. There's nobody prepared to handle the tremendous job of programing civilian production. A 100% CMP would almost certainly delay start of the plan by three months, possibly six. NPA is determined to get started July 1.

Most likely, CMP-1951 will start out as an open-end plan, move through gradual stages to a 100% plan: Civilian items will be programed as experience shows essential items are disappearing from production schedules. Result should be a 100% plan by the first or second quarter of 1952.

There's one more reason why you should mark April 15. That's the date NPA will send out CMP application forms to prime consumers. (In CMP lingo, a consumer is anyone who needs a controlled material to meet demands for military production or essential supporting activities. The "prime" is the man who deals directly with the government. A "secondary" consumer is a subcontractor.)

Prime consumers will have until May 31 to submit their CMP applications covering third-quarter requirements to the claimant agencies. (The claimant is the agency for which you are doing the work, like the Army, Navy, or Air Force on a military contract; or the agency which has authorized the work, like DTA on the freight car program.)

The fact that you will have only six weeks (April 15-May 31) to compile and summarize the Bills of Materials needed for the applications means both prime and secondary consumers will have to work at breakneck speed. But a high official of NPA warns: Don't try now to prepare for CMP by following World War II rules. Mechanical details will be changed enough to make most of such work lost effort and a waste of money.

You'll also be under heavy pressure in preparing applications for your fourth-quarter requirements. These will be due July 15—just six weeks after the third-quarter forms. But after that, you'll have a full three months in which to prepare applications for the succeeding quarter.

Actual allotments for third-quarter production will go out to prime consumers as soon as possible after May 31. But you can count on a log-jam. Off-the-cuff estimates are that NPA will have about 45,000 applications to process, and less than 30 days scheduled in which to do it.

LOOKING AHEAD IN LABOR

Last-minute round-up as we go to press

Big Labor says Mobilizer Wilson must go. That's the price for full cooperation in mobilization.

Publicly, the United Labor Policy Committee says it must have a greater voice at the policy and administrative level of defense planning.

Privately, labor leaders put all the blame on Wilson. Truman gave Wilson the wide powers he uses, but gets little criticism. Except from railroad unions. They are drumming up opposition to Truman in '52 for breaking the railroad strike.

AFL and CIO would like to dump Truman, too. They did it in '48 before Truman's nomination. But they won't go out on a limb this early. Eventually will back Truman again, if he runs.

Big Labor's feeling against Wilson: He's anti-labor, not one of their kind. They don't trust him, even call him "treacherous." Specifically, they say he is behind drive to raise work week beyond 40 hours without premium overtime.

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Labor will continue to raise hell in Washington even if Wilson goes and/or Truman makes a deal. We are not at war, officially. Business men will still fill top mobilization posts. And the Reuthers and Reuther imitators cannot appear to be satisfied under any kind of controls. Not if they want to get re-elected.

Unlike 1942, CIO, AFL, and railroad unions stick together this time. Through the Labor Policy Committee, they agree not only on objectives, but also on strategy and selection of labor executives to fill the jobs they want. John L. Lewis, again a lone wolf, adds to labor's gripe by getting government favors without cooperation.

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Wage and manpower policies disturb Big Labor most. On wages, labor members quit the Wage Stabilization Board because they felt the 10% "catch-up" policy was unfair. Here's their beef:

- By using January 1950 base date, it OK'd 20% Lewis's mine workers have got since then.
- It approved General Motors-type cost-of-living escalators through May, but left in the air the 4-cent annual improvement increase due in June.
- It wrote off pensions and other fringe benefits committed since early 1950, but will charge future fringe costs against the 10% limit.

As sent to Stabilizer Johnston for approval, this policy is to run until June 30, when Defense Production Act may be amended. The 10% will likely be raised in May on the basis of rise in living costs. A special policy for pension and welfare plans is under study.

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More strikes loom ahead. Some will stem from agreements and contracts which allow increases in excess of stabilization limit. The first may come in meat packing. The recent 9-cent boost seems to pierce the 10% ceiling.

Reuther threatens to strike auto and other plants with GM-style contracts if the June cost-of-living and annual improvement raises are sidetracked. Other strikes will hit employers who do not grant increases up to allowable limits.

WSB will get authority to settle disputes, too. Like the War Labor Board did. But the job will be tougher. There's no war. No plan for a labor-management conference to back it up. And labor won't give a no-strike pledge.

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On manpower, Big Labor really worries over two things: (1) compulsory job controls; (2) military favoritism. That's why Murray and Greene made such a fuss when Wilson took manpower policy out of Labor Secretary Tobin's office, retained it in ODM under Arthur S. Flemming, a Republican.

With Tobin, job freezes, manpower ceilings, and the like would be slower coming. Also, defense industries would get better break in keeping skilled workers out of the draft. Labor fears Flemming may be under domination of Gen. Lucius Clay, Wilson aide; may give preference to military.

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Taft-Hartley's method for handling national emergency strikes may be revised. There is growing sentiment for seizure in place of the 80-day injunction. Taft is for it. Seizure didn't prevent the railroad strike, but Truman's work-or-be-fired order ended it.

LOOKING AHEAD IN BUSINESS

Last-minute round-up as we go to press

The forced draft of inflation is pushing business to new peaks—where it expected conversion troubles.

Unemployment is very low—even in areas like Detroit where cutbacks on metals have brought layoffs in autos and appliances.

Department store sales in January, instead of dropping after Christmas, ran 26% ahead of a year ago. Mail order stores even better—up 45%.

The construction industry blinks at figures on contract awards. They've been running 70% ahead of last year. Contracts for industrial building have soared more than 700%.

Home builders—started 87,000 new units in January—more than 10% above a year ago. Means maybe 500,000 starts in first half of 1951.

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The build-up of military production—and tightening restrictions on civilian output—will slow this boom.

As NPA tightens up on use of steel and nonferrous metals, and inventories are worked down, sales of durable goods will drop.

But rising military production will take up the slack rapidly. "Conversion unemployment" is likely to be only spotty, won't last long.

As business in durables is cut back, customers are likely to shift to soft goods—textiles, apparel, food. Today's sales records reflect the fact that customers are loaded with money. They'll have more as the wage freeze thaws.

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How well are we doing in raising productivity—industrial efficiency—particularly in manufacturing? That's a question businessmen have been asking since the end of World War II, when productivity was lagging badly.

Government experts have now weighed in with the answer: *None too well.* Their figures show that productivity rose less than 1% a year between 1939 and 1947.

The gain was better in 1948 and '49, by the findings of other surveys. Still, manufacturing has raised efficiency an average of only about 1.5% a year between 1939 and 1949—about half the average gain in the '20s and '30s.

There's been better progress in other sections of the economy. Farmers, the transportation industries, and service businesses have raised their productivity more than manufacturers have.

So—for the country as a whole—productivity has gained slightly more than 2% a year on the average over the 1939-49 decade. That's as good or a little better than the long-term average gain between 1860 and 1940.

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Can manufacturing industries raise their productivity rapidly now—to meet demands for more and more production?

The experts are doubtful. They point out that we are starting to mobilize with most of industry running at capacity—and bottlenecks cropping up all over. Shortages of manpower and materials make it much tougher to raise productivity.

But the experts have one big hope: That's the possibility for raising efficiency in plants that are now below standard.

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The battle now going on between the Federal Reserve Board and the U.S. Treasury is worth keeping your eye on.

On the surface it looks like a technical squabble over interest rates. But if the Reserve loses, it loses one of the basic weapons against inflation.

If the Reserve Board is forced to support the government bond market and underwrite low interest rates, there'll be no check on the Treasury in selling bonds to the banks. In these days, that is the equivalent of printing-press money.

Price and wage controls hit the headlines—but they're light weapons in the inflation fight. The heavy-duty artillery is pay-as-you-go taxes and tight credit controls. Unless they can be brought to bear, controls won't check inflation.

So what happens in the Treasury-Federal Reserve battle now may well set the course of prices in another six months or a year.

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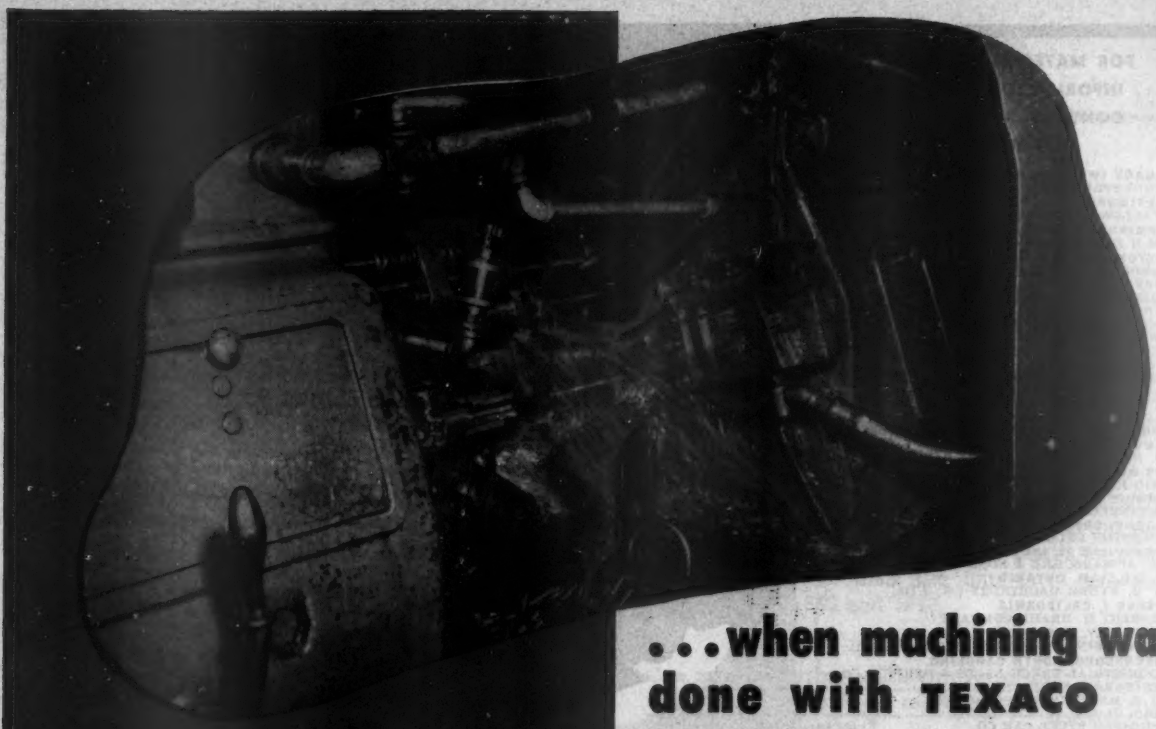

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FACTORY MANAGEMENT AND MAINTENANCE

HARRY LEE WADDELL, EDITOR

Pinpointing the Manpower Problem

IN A LONG-PULL MOBILIZATION, industry needs to be sure of a supply of "idea men."

When you talk to manufacturers, a lot of them say: "The draft won't hurt us much, so long as it sticks to the under-26 group." But some who are looking ahead to the problems of a long-drawn-out preparedness effort are worried. They are afraid a draft program that takes nearly every young man under 26 will cripple them in a vital spot—and, by crippling them, hurt the long-pull plan for a combination of military alertness and economic health.

THE VITAL 7%

One large, well-managed manufacturing company has given us an analysis of its work force that makes the point clear. Here are its highlights:

1. Just under 7% of the company's 24,700 people do work that is essential to the productive employment of the other 93%.

2. The ratio of young men in some of the specialized jobs that make up the 7% is quite high—and, by the nature of the jobs, this must be so.

3. Even though many of these men are young, they must have a lot of education and experience to fit them for the work.

This company breaks the "idea" phase of its manufacturing operation into three parts:

Research • Only 160, or two-thirds of 1%, of the 24,700 employees are in this work. The minimums of education, training, and experience needed to do the average job in the group are: education, four years of college; company training, two years; job experience, four years. Yet 12% of the men in this work are under 26, and another 27% are 26 to 30. Only 32% are over 35.

Engineering • There are 190 men in this work, or three-fourths of 1% of the total force. The education, training, and experience requirements are the same as in research. Here is the age breakdown: under 26, 26%; 26 to 30, 22%; over 35, 28%.

Metallurgical • The 130 men in this work make up only one-half of 1% of the total force. The educational, training, and experience requirements are the same as for research and engineering, except that in some cases an extra four years of company training can take the place of four years in college. In this group, nearly 33% are under 26, 15% are 26 to 30, and only 27% are over 35.

These three groups make up slightly less than 2% of the company's total work force. The rest of the vital 7% are in production planning, tool design, toolroom, and pattern shop. In these groups, the ratio of older men is much higher than in research, engineering, and metallurgical.

THE CRITICAL 2%

It's quite logical that the "idea" phases of the manufacturing process should be heavily weighted with young men. Here is the stage where fresh thinking is most needed. Where new views of science and technology are most likely to be put to work. Where tradition should most often be cast aside.

So it's not enough just to "freeze" the present members of this critical 2% in their "idea" jobs. There must be a steady flow of young men into these groups.

This wouldn't be so important if our military effort should turn into an all-out war. In that case there would be some end in sight. Of course, we would be wise to keep bright young thinkers in war industry, but we could get by for a while without a fresh supply. A long-pull mobilization is another matter. The assurance of a flow of new ideas and new technology far into the future is absolutely essential.

It won't be easy to come up with a draft policy that will give such assurance. But it should be high on the agenda of the mobilization planners.

MOBILIZATION:

AND HOW CATERPILLAR

By Six Members of Management
Caterpillar Tractor Company
and Carroll W. Boyce
National Affairs Editor, FACTORY

● For several years, Caterpillar Tractor Company's management has made an "annual report to management" on the progress and accomplishments *of the previous year*. This year, President L. B. Neumiller decided that the times called for a report *on the year ahead*. We think it significant that Neumiller chose three production men to be among the officials who presented this report to the more than 1800 members of management.

The report was made at a dinner meeting on January 28. It was hard-hitting, largely off-the-record. The portions that can be reported directly point up the problems Caterpillar – and you – will face as mobilization moves ahead. They also point up some of the solutions, as Caterpillar sees them.

FACTORY's National Affairs Editor visited Caterpillar, talked with the officials quoted here and many others. From these conversations, he is able to fill in details of both problems and solutions mentioned at the meeting. He also gives you a picture of Caterpillar's long-standing policies on these matters – things that weren't mentioned at the meeting because they are already well understood by all Caterpillar management.

THE OVERALL PROBLEM

Louis B. Neumiller, President

PROBLEM: "The national emergency means wholesale disruption to our business and personal lives...

"The staggering proportions of expenditures called for by the national emergency will bring taxes almost to the point of confiscation. However, the alternative would be piling debt upon debt, which could well lead to the collapse of America's monetary system – and national ruin."

SOLUTION: "We must draw upon previous experience in times of disruption and abnormally high taxes [World War II] for the lessons that will help us maintain our strength as a company as well as our personal security as employees...

"Let us be many small companies under one roof. In your leadership, set an example of moderation, friendliness, and good humor. Know your people, talk with them, know what they are doing."

FACTORY'S COMMENT: Caterpillar will have less to re-learn from World War II than many companies because of its deliberate war-end policy of continuing desirable wartime practices. It paid off in peacetime, will pay off even more in mobilization.

SIX BIG PROBLEMS

TRACTOR PLANS TO LICK THEM

THE CONVERSION PROBLEM

Gail Spain, Vice President

PROBLEM: "We must move both internally and externally toward operation under an industrial mobilization plan calling for 62% of our production for the military forces and 38% for essential civilian uses."

SOLUTION: "A blueprint, approved by the military, which specifies (1) the amount and kind of products Caterpillar can build during a national emergency, and (2) which branches of the military will acquire the products and in what amounts.

"This plan is the first of its kind to be completed in the construction equipment industry, and has been used by the military as a model in developing similar plans in other industries."

FACTORY'S COMMENT: Caterpillar is comparatively fortunate in that its defense products will differ little from its peacetime products. That means its conversion problems will be small.

This set of facts also gave the company an edge in working out its mobilization plan for military production. But because the plan has been approved by the military, publication of details is forbidden by security regulations.

THE SABOTAGE PROBLEM

J. R. Munro, Director of Manufacturing

PROBLEM: "The real threat America faces today is that of Red sabotage . . .

"World War II security measures will not be sufficient in themselves to protect industrial plant properties from sabotage. Proper and authorized entry to plant property can be made by those we might consider to be detrimental to our security."

SOLUTION: "A rigid policy of policing plant entrances is not the whole answer to maintaining the security of our plant. Without neglecting possible danger from outside, we must shift our emphasis to an increased awareness of the possible danger from within.

"The burden of searching out subversives and protecting industrial might from their destructive efforts rests largely on industrial management, and particularly on the alertness of employees and first-line supervisors. No government agency, no one else is going to do the job for us!"

FACTORY'S COMMENT: A-bombs *may* fall; sabotage is almost certain and there's no easy answer. Caterpillar's whole management team will be geared up to choke off the threat at its source.

More on next page

MOBILIZATION . . . begins on page 68

THE MATERIALS PROBLEM

William Naumann, Assistant General Factory Manager

PROBLEM: "The company's most pressing problem is keeping a pipeline of supplies flowing into the plant. The Caterpillar plant has a tremendous appetite for tools, materials, and supplies. About 3500 tons of material must be brought into the plant every 24 hours to maintain normal manufacturing schedules.

"The problem is further aggravated by military demands for design changes and for special attachments not originally scheduled for manufacture."

SOLUTION: "In the first place, purchasing people are working night and day to procure material in line with our requirements . . .

"We are using substitutes wherever possible. But the use of substitute materials involves many problems in itself, the most important of which is the maintenance of quality . . .

"We are also placing greater emphasis on conservation of material . . .

"But until we have a national program of materials allocation we are going to be in pain, and our schedules and deliveries to the parts department are going to be in jeopardy."

FACTORY'S COMMENT: Caterpillar's products are not like automobiles, intended for a consumer market that demands a lot of frills. So redesign to eliminate nonfunctional elements can't be expected to save much for Caterpillar. But all the products are being gone over with this in mind.

The company's inventory control procedures are set up in such a way as to indicate the gross weight of any given material received and the net weight shipped in the form of finished parts and products. The difference is potential material recovery. Caterpillar will redouble its efforts toward 100% recovery. (How this inventory control plan works, how it will tie in with the forthcoming Controlled Materials Plan, will be told in detail in the next issue of FACTORY.)

Changes in production schedules always mean more setups in the shop. Caterpillar practice has been to have individual operators make their own setups. But the company recognizes that it may not be possible to give new operators enough training for them to do this. So Caterpillar is getting ready to train key operators in the departments to do much of the setup work. However, they will not be full-time setup men, in the sense that many companies use setup men. Rather, they will be operators skilled in making setups who will assist the supervisor and new operator in setting up. Caterpillar believes that giving the individual operator the fullest possible responsibility for his job is good practice, will do this as long as it can.

One thing that will make this possible to a degree some companies may not be able to match is the nature of the vestibule school planned for shop operators. From the very start of vestibule training, new operators will work on actual production. The work pace may be slow. The reject rate may be high. But the fact that the trainees are contributing to net production means the company can keep them in the vestibule school longer than might otherwise be justified.

THE MANPOWER PROBLEM

C. A. Woodley, General Factory Manager

PROBLEM: "The company is faced with almost certain manpower shortages at a time when production requirements are rising . . .

"We must meet production goals without a return to the crowded and confused conditions of World War II."

SOLUTION: "We must continue the improvement in the individual performance of all our people. Recent plant rearrangement and expansion have permitted better housekeeping and freedom of movement of people and materials; more must be done. And we need still newer and better equipment, greater selectivity in the hiring and placement of new employees, and better management know-how."

FACTORY'S COMMENT: Caterpillar's long-standing reputation in its community as a good place to work will help plenty when the manpower pinch comes. But no one expects the job to be easy.

Choice of Woodley, the general factory manager, to

report on coming manpower problems emphasizes a point Caterpillar people think is important:

The manpower shortage poses *production* problems; the solutions must be based on production needs:

1. Selection. In the last war, many companies hired workers who could not meet peacetime standards, on the theory that "half a man is better than none." Caterpillar feels this practice lowered morale of the workforce, created many supervisory problems.

Caterpillar is determined this time to resist the half-a-man philosophy as long as possible. Management feels that an efficient workforce, better supervision, better methods, and mechanization can make up for any lack of "bodies" in the foreseeable future.

It's only fair to report that Caterpillar's reputation will help it hew to this line longer than may be possible for some other companies. But holding out as long as you can will pay dividends for any company.

2. Induction. Caterpillar has relied heavily on line supervisors in its employee indoctrination. It has established the authority and management status of the supervisor right from the outset. However, with an increasing percentage of inexperienced employees, supervisors will have to spend more time at the benches.

So Caterpillar will gear its induction procedures to the time demands that can reasonably be made on supervisors. The objective is to continue to rely on supervisors right up to the limit of the time they can take from their other shop duties.

3. Training. Apart from the apprentice school, most of Caterpillar's "training program" has been for supervisors. Operator training has been in the hands of the supervisors.

The tempo of supervisory training will be stepped up as it is necessary to make new supervisors more quickly. This in itself will lessen the need for "program" training of operators.

But it's recognized that complete on-the-job training will not be possible. So Caterpillar plans to train shop supervisors to step up from the shops and take on the off-the-job and vestibule training programs.

4. Absenteeism. It's Caterpillar's conviction, backed by World War II experience of hundreds of companies, that winking at absenteeism is bad business. Production suffers not only from time lost by absentees, but also from lowered morale of workers who do show up.

Absenteeism seldom starts among old-time employees until the pattern is set by "war workers" who aren't dependent on their new jobs for their livelihood. The only solution is to insist, from the start, that every employee live up to attendance rules or expect to be disciplined. The result *can* be increased turnover. But the increase won't be excessive if, like Caterpillar, you maintain your hiring standards.

5. Separations. In peacetime there is a feeling among many companies that if an employee wants to quit you should not discourage him. The theory is that if you talk him into staying he will be a dissatisfied employee. Obviously, that's true of a man who has to be either needled or bribed to stay on the job.

But a good exit interview will often show that a man is leaving either because of some condition that can and should be corrected, or for no real reason at all. While exit interviews – and good ones – are nothing new to Caterpillar, the company plans to increase its efforts to encourage good employees to stay on the job.

THE HEALTH PROBLEM

Dr. Harold Vonachen, Medical Director

PROBLEM: "The average person is a great gambler with his personal health. He heaps abuses upon himself that destroy his health . . .

"Particularly in times of emergency, a person's loss of health affects not only himself but his family, his company, his community, and the nation.

"About 60% of today's physical illness results from emotional instability."

SOLUTION: "More frequent, thorough physical checkups. But don't forget that a doctor's examination will not take the place of sound living habits . . .

"Avoid overeating and indifference to a balanced diet; lack of exercise; abuse of exercise; and insufficient rest . . .

"To overcome emotional disturbances, a person must be realistic about his problems and seek the answer not in some other person but within himself."

FACTORY'S COMMENT: Caterpillar has long required periodic examinations of top personnel, will urge all management people to take advantage of its medical facilities for more frequent checkups.

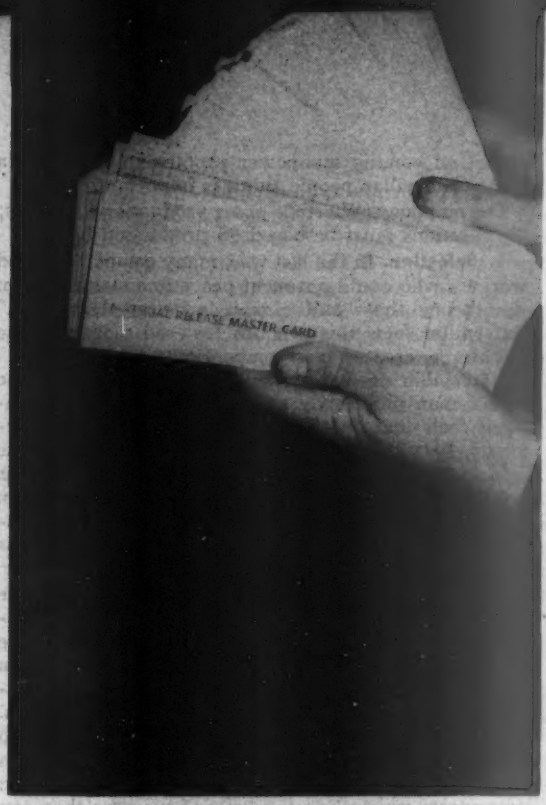
The company will step up its screening of operators of motive-power equipment. Poor vision, cardiac ailments, and neuroses in such people create a danger to the personal safety of others in the plant. Medical examinations will be given employees transferring to jobs having stiffer physical requirements. The company is keenly aware of the relationship of physical well-being to safety. Medical and safety departments will work closely to maintain Caterpillar's record.

Without disputing Dr. Vonachen's point that people must find the solutions to emotional problems within themselves, we should point out that Caterpillar is not leaving employees entirely "on their own" in this respect. The company has a mental hygiene section in the medical department. Careful testing and skilled counseling are available to help those who want help.

Caterpillar places great emphasis on the importance of its management team, looks on the good health of the team as a prime asset of the company.

OPERATOR KEY-PUNCHES . . .

In the factory tabulating section at Douglas Aircraft Company, two master cards are key-punched for each of the maybe 150,000 parts in a plane.



. . . THESE MASTER CARDS . . .

Parts and materials list at Douglas is now composed of key-punched tabulating cards. Used to be hand written, hand tabulated, and hand summarized.

Cuts Paperwork-Preparation Time From Six Weeks to Fifteen Hours

By H. A. STEWART
Supervisor, Factory Tabulation Section
Douglas Aircraft Company, Santa Monica, Calif.

IT USED TO TAKE SIX WEEKS at Douglas Aircraft Company to compile parts and materials lists from an approved aircraft blueprint. That time has now been cut to as little as 15 hours. It's one of the benefits—admittedly the most spectacular—that Douglas is getting from its new factory tabulating group.

OLD METHOD • When the engineering department approved an aircraft design, the blueprint went to the planning section. Here a planner dissected the plane into detailed parts and materials. Then separate orders for each of perhaps 150,000 parts had to be hand written, hand tabulated, and hand summarized. After perhaps six weeks of manual paperwork, the purchasing department had the requisitions it needed.

NEW METHOD • No machine has yet been invented that can scan a blueprint and dissect it into parts and materials. This part of the job still has to be done by the planner. But from there on things are different. The operators key-punch master parts and materials cards. When a production order comes through, the cards are processed through tabulating, summarizing, and extending machines. And out comes a typed parts-and-materials list for as many planes as may be indicated. It's all done in as little as 15 hours from the time the tabulating section gets the production order. Doesn't matter, of course, whether the order calls for one or 100 planes.

OTHER BENEFITS • That's not all. There are other benefits from this application of tabulating machines to production control. They are not so spectacular as the speedup in paper-preparation time. But they are similarly helpful in the Douglas campaign to *produce more and waste less.*

For instance, advanced ordering and buildup of inventories to meet actual production are now possible. The tabulating group can produce stockroom paper, including a quick debit-credit system against inventories, as soon as work orders come through.

It can furnish valuable production and statistical

...TO GET THIS PURCHASE REQUISITION

Key-punched parts and materials cards are processed through automatic machines that tabulate and deliver a complete list for as many planes as may be indicated. List can be handed to purchasing department in as little as 15 hours from time production order is received. Same paperwork used to take up to six weeks.

information for tooling, planning, manufacturing, and material sections. It can provide "shortage forecasts" to help the purchasing department maintain proper inventories.

BYPRODUCTS • Since cards are punched with data on material breakdowns required to fabricate and assemble all parts, the byproducts of the new system are impressive:

Planning gets (1) purchased parts catalog, (2) stock parts catalog, (3) sales release order, (4) planning job register.

Production control gets (1) spare parts shortage forecast, (2) stock record cards, (3) production stockroom shortage forecast, (4) overstock tabulation, and (5) inspection rejections.

Manufacturing gets pre-punched and interpreted tabulating cards for selective manufacturing orders, necessary to accumulate time for costings as well as shop-loading purposes.

Tooling gets (1) a pre-punched and interpreted tabulating card for each tool ordered, (2) pre-punched time tickets, (3) master tools cards and summarization with daily time charges for making each tool, (4) cumulative cost record for each tool, (5) tooling reports—i.e., complete history for use in future estimating, (5) tabulation by due dates and departments to determine departmental load, and (6) tabulation of active, completed, and canceled orders on all projects by sections.

TOOLING TIME CARDS • Here is a good example of byproduct savings. The tooling department had a problem. Every time a man stopped work on one tooling project and began another, he had to fill out a time card. Of course, he had to write in his name, number, date, etc. But he also had to provide (1) contract number of tool, (2) section and assembly of aircraft to which the tool was assigned, (3) information requested by the timekeeping department, (4) tool number, (5) tool code, and other data.

All this paperwork took at least two or three minutes. Each toolmaker had to do it three or four times a day. The cards had to be checked for errors. Since about 1600 cards were turned in daily, you can see it meant a lot of time wasted by both toolmakers and accounting department people.

So the factory tabulating group came up with the idea of pre-punching time cards. Today a number of pre-punched cards accompany the tooling order. Just how many for each order varies according to a formula worked out by H. A. Stewart, supervisor of the group.

All information is now pre-punched except the toolmaker's name, number, time he started, time he finished, etc. This takes just a few seconds. There is little chance for error.

Also, the old cards had to be processed in the accounting department by hand. Now it's a simple job for the tabulating machine. Incidentally, there's no extra work for the accounting department. Cards had to be punched anyway. Now it's done before tooling orders go out, not afterwards.

1924 The original conditions on which Bigelow-Sanford based its play. This picture was taken in 1924 in the Hawthorne Plant of Western Electric Company. Six girls were used as subjects of the famous "Hawthorne experiment." The first two, picked by management, were allowed to choose the four others they wanted to work with them. All six worked on regular electrical assembly jobs at the workbenches shown here. Note how closely Bigelow made its 1950 stage setting (right) resemble the 1924 conditions. Similarly, the company was careful to follow faithfully all the changes in working conditions that the researchers made in the original study. The same production figures were used, too.

WHAT MADE GERTRUDE GIVE

Why, it's morale that made Gertrude give, Bigelow-Sanford Carpet Company tells its foremen and higher management men. Don't listen to people who tell you you can't define it, says the company. You have to define it—and you have to make it work in actual operating practice.

IN THE PICTURES here and on the following page you'll see the dramatic and unusually effective method Bigelow has used to get across the true meaning of morale.

"What Made Gertrude Give" was the highlight of a fast-moving one-day conference on morale held for all of manufacturing management. It's a play based exactly on the famous "Hawthorne Experiment" at Western Electric over 25 years ago. It's still a classic. In trying to test the effects of changes in working conditions, the researchers found that *everything* they did increased production. The reason: *High morale.*

And the reason for Bigelow's interest, for its conference, and for *What Made Gertrude Give*? The answer is simple: The company regards the ability to create sustained high morale as the most important ingredient of industrial leadership. In the words of Manufacturing Vice President Elliott I. Petersen:

"We spend our time training men, teaching procedures, refining methods, installing new equipment. These make a good team—but they don't necessarily win victories."

And, says Petersen:

"You know as well as I that true morale comes from within. You can't buy it, you can't get it out of text books or meetings. Morale comes with leadership."

Although Bigelow was careful to make its facts and setting quite authentic, the performers' parts in *What Made Gertrude Give* were deliberately burlesqued. Here's why, according to John W. Griffin, the

1950 Here's Bigelow's up-to-date version of the workplace shown in the picture on the left. Note the close similarities in layout. The 1950 "girls," of course, look a little different. But their presence really stopped the show. Another difference—the 1950 "girls" had the job of assembling meat grinders instead of electrical equipment. The script that Bigelow worked up for the play is entirely in verse. Some sections are set up to be sung, as well. All performers were members of the company's management organization, and well known to the audience. In this picture, Mack—the foreman—is giving the girls more light. Sliderule—the engineer—watches on the left. They find that more light brings more production. Then . . .

company's training director, and the man behind the scenes for the whole conference program:

"We were trying to get an immensely serious point across. We felt we could do it best by a humorous approach in which the idea would gradually emerge, without any taint of preaching. And that's exactly what happened."

How about results? This is what Griffin says:

"We're not looking for dollars and cents. We planned the play to make impact—to make sure no man who saw it would ever forget the occasion and the point. We know that's true to date—four months later. Our foremen's actions on the job show it. Their drive, interest, and preoccupation with bettering our human relations are remarkable. What we're getting, we don't think we'd have got any other way."

. . . THE PLAY CONTINUES

LIGHTING IS REDUCED, AS ONE TEST. HERE MACK, THE FOREMEN, TAKES AWAY LIGHT BULBS. NOTE GERTRUDE, USING FLASHLIGHT. PART OF THE VERSE:

The lights went down, the girls complained,
Yet they soon found when we explained
That they weren't bound to have eyes strained,
So grinders ground, and output gained.

Turn the page

WHAT MADE GERTRUDE GIVE . . . begins on page 74

REST PERIODS WERE EXPERIMENTED WITH, TOO. HERE THE GIRLS ARE RELAXING. AND HERE IS PART OF THE VERSE:

Then the girls did suggest we change
conditions of test,
That they could do best and work with new zest
If given a five-minute rest. We accepted with glee
Their justified plea for periods at ten and at three.
We realize that all you guys
May well surmise without surprise
That output continued to rise.

NEXT CAME EXPERIMENTS ON PIECEWORK PLANS, FOLLOWED BY SNACKS:

The girls wanted lunch or brunch,
Just something to munch or crunch,
But we had a hunch that the thing for the bunch,
To give output a punch was a big
steaming helping of SOUP.

THE RESULTS—ALL GOOD. AS PART OF THE FINALE, THE GIRLS SING TO THE TUNE OF "I'VE BEEN WORKING ON THE RAILROAD":

We've been working in the test room
All the livelong day,
Grinders we have been assembling
Just to earn our weekly pay.
There've been a lot of fine improvements
Since the tests got under way.
Now the final change is coming.
Gertrude, won't you give?
Gertrude, won't you give? . . . Make production soar.

BACK TO NORMAL—AFTER OTHER CHANGES, MOSTLY IN HOURS OF WORK:

At last we did reinstitute
the first conditions of the test.
Once again they quit at five but actually
were not depressed.
They lost an hour of liberty, which failed
to depress their glee.
They rapidly surpassed their goal—
they far outdid their previous best.

Central Fileroom Saves 'Em Plenty

By CHARLES E. STUDEN • Industrial Engineer
E. F. Hauserman Company, Cleveland

WE'RE SAVING THOUSANDS of dollars in materials and labor costs with our central plant filing system. Two things have done it: The room itself has centralized the filing. And, with the room, we have eliminated a lot of unnecessary handling of contract blueprints, piece-parts blueprints, and bills of material.

In addition, more people see what they need to see—in less time and with better results.

Right after the war we found that we had on hand and were using 68,000 contract blueprints, 36,000 piece-parts blueprints, 20,000 data-manual copies, and about 2-million bills-of-material copy sheets a year—covering a wide variety of movable steel partitions, wainscoting, doors, etc.

These blueprints, bills of material, and their revisions were the only job information available to us. We needed good control, but didn't have it.

OLD WAY • By checking our filing system, such as it was, we found the data were being handled this way:

1. Prints, print revisions, billings, and billing revisions were delivered to the shop by regular company mail service.
2. Prints and billings for fabrication in any one department were going to every department. That is, when a bill of materials was listed by engineering, all pertinent prints for that billing went to every department. The department head was getting much more than he needed.
3. Large numbers of prints and billings piled up in every department.
4. They were delivered to the various departments in folios and were broken up into single-sheet prints for the various operations. Most of the time they were never reassembled into folios. And they weren't returned, making reference and reuse impossible.
5. Prints for completed contracts and obsolete prints weren't taken out of the files. This caused confusion.
6. Misplaced prints caused stoppages of machines and lost valuable time for management.
7. Revisions on prints and billings were sent by interoffice mail to the department and the departments were responsible for the posting of the revisions.

CENTRAL FILEROOM puts over 2-million production prints and bills of materials right at the clerk's elbow.

NEW WAY • To end all this confusion, we built our central fileroom. It's suspended over an unused area, so we're not using any manufacturing space. It's well lighted and enclosed by glass. All contract prints, piece-part prints, data manuals, print revisions, bills of materials, and their revisions are filed there.

They are available to anyone in the plant. But they must be drawn out on a requisition form showing name, date, and department. This tells us at a moment's notice where we can find any print or bill we want.

Two prints are issued for each detail on each contract. When all the prints are produced to complete a contract, only two complete folios have been issued to the plant. One folio, or any single sheet from a folio, follows the entire job through each subsequent operation. The other set is kept in the fileroom for reference.

The fileroom attendant is responsible for:

1. Filing prints and bills when originally issued.
2. Issuing prints and billings requested.
3. Re-filing returns in proper sequence.
4. Replacing torn or mutilated prints.
5. Withdrawing all obsolete, revised, or completed prints from the file.
6. Inspecting returned prints to make sure they are complete and not defaced.
7. Taking care that all requisitions are immediately recorded, and revised drawings or bills of material are corrected or destroyed.
8. Servicing and keeping up to date all piece-part books in all departments.

IDEAS OF THE MONTH for

WANT DEFENSE ORDERS? Try Wright Aeronautical Corp., Wood-Ridge, N. J. It's now signing up qualified subcontractors on government orders for aircraft engines. (Or tell the world about your facilities in a booklet—like the one we got from the Everedy Co., Frederick, Md.)

NEW WAY TO SELL THE IDEA of palletization in your plant: Show how it *reduces tons handled per ton of product.* From 30 to 12 is the record hung up by British Light Steel Pressings, Ltd., Acton, London—which, so far as we know, is the first company to use this yardstick.

NEED MORE WATER? Maybe "dowsing" is your answer. We've just read *Henry Gross and His Dowsing Rod*—and we're not kidding. It's by Kenneth Roberts, the famous author. At your bookstore.

REVOLUTIONARY is the word for Shellnest. It's made out of one piece of corrugated board. Folds quickly into a nest with extra cushioning strength in each partition. Shelton Mfg. Co., Inc., Long Island City, N. Y.

MAGIC MIRROR won't shatter, doesn't steam up. It's made of Plexiglas. Can be molded for quantity production. Can be used wherever glass mirrors are now being used—says Flexmir, Inc., Newark, N. J.

ONE SQUEEZE—and a device made by Trig-A-Tape Corp., Jamaica, N. Y., feeds, cuts, and attaches a strip of self-adhesive tape.

YARDSTICKER is an adhesive measuring tape that is printed from 1 to 36 inches and repeat. Comes in rolls 1 inch wide by 18 yards long. The Stick-E-Ruler Co., Watkins Glen, N. Y.

SMOG is literally in the bag—glass fiber bags, to be exact—at General Metals Corp., Los Angeles. Some 450 pounds of solid material are sidetracked each day. General Metals and Whiting Corp. (which built the furnaces) worked out the problem.

IT'S EASY TO BEND is the title of a bending manual you can get free from O'Neil-Irwin Mfg. Co., Lake City, Minn. The numerous illustrations naturally show the company's own benders, but the ideas apply to any rotary-type bending machine.

HANDY CALCULATOR puts conventional computing methods in the shade when it comes to figuring weight and length of strip metals in coils or straight lengths. Set width opposite thickness on dial, read pounds opposite feet. Free. Precision Steel Warehouse, Inc., 4401 W. Kinzie, Chicago 24.

Factory Executives

AN ATOMIC COLLEGE you can send your engineers to has been established by AEC. School begins Sept. 10. Application deadline, April 1. Write to Director, Oak Ridge School of Reactor Technology, Oak Ridge, Tenn.

ACCORDION HOSE fits standard commercial vacuum cleaners. Stretches from 6 feet to 14½ feet—without the slightest tension, says Pullman Sales Corp., 581 Boylston St., Boston.

TRAFFIC-LINE spreader lays down paint in fractional widths from 2 inches to 8 inches. No power unit. Gravity feed. Universal Marine & Mfg. Co., 137 Alexander St., Yonkers 2, N. Y.

CATALOG OF THE MONTH is Carboloy's new 60-pager. It not only lists carbide tools and parts, but also tells how to select and apply them. Lots of four-color illustrations. *And a pictorial index.* Carboloy Co., Inc., Box 237—Roosevelt Park Annex, Detroit.

RAINDROPS OF UNDERSTANDING is the title of a collection of ads used by Armco Steel Corp., Middletown, Ohio. They show employees the advantage of the American way of life, usually in terms of their own jobs. Write Hugh W. Wright if you'd like a copy.

PAINT THAT CHANGES COLOR automatically at increasing temperatures is helping Socony-Vacuum Oil Co., Inc., 26 Broadway, New York 4, study cooling processes. There are 15 basic paints. Some of them are capable of six complete color changes. For example, one is violet blue when cold, becomes bright green at 311 deg. F., olive green at 446, dark gray at 545, light gray at 554, light brown at 572, and buff at 644 deg. F.

CONSERVE ESSENTIAL ALLOYS by using metallic and nonmetallic coatings for gray iron. A manual tells how. Gray Iron Founders' Society, Inc., 210 National City—East 6th Bldg., Cleveland 14. $1.75 to non-members.

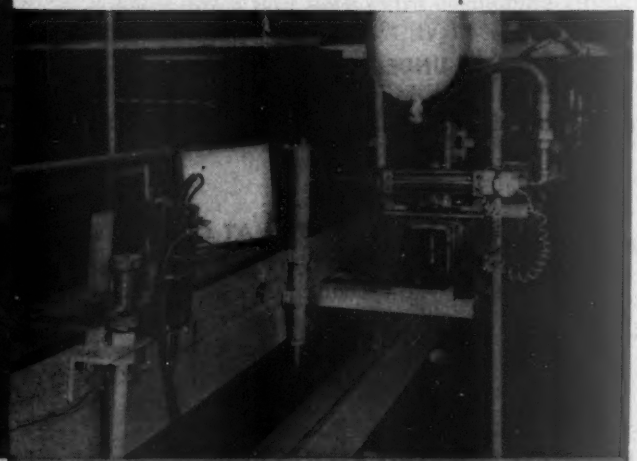
CRYSTAL DETECTION — just announced by General Electric X-Ray Corp., Milwaukee—is a highspeed (as high as 600 units a minute) x-ray technique that will cut your inspection costs, conserve your manpower. You use it, say its developers, to solve problems like (1) controlling and checking product level in containers; (2) detecting voids, cracks, cavitation, and variation in material thickness; (3) checking for absence, misplacement, or misalignment of inserts or other internal parts.

SORRY. Those Neoprene slip-over covers for drums (attributed in January "Ideas" to Snead & Co., Orange, Va.) are made by Chase Bag Co., 309 W. Jackson Blvd., Chicago 6. Snead makes shelf cases that save you space.

From Assembly to Storage Automatically

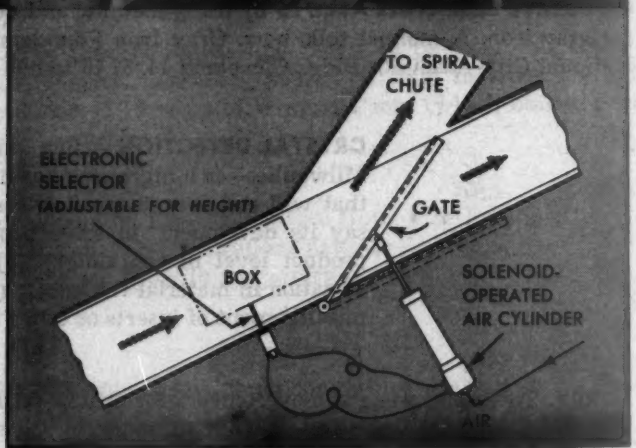
Why waste men's time on handling—when you can get equipment to do it for you?

Western Electric's new close-to-automatic handling system is loaded with ideas for plant operating men who grasp the need in this national emergency to make best use of men and machines.



1 TELEPHONE SETS SPIRAL DOWN . . . Spiral conveyor receives packaged sets from ceiling-high belt conveyor, which picks them up from the final assembly lines. Here sets are chuted through assembly department floor to another belt conveyor which runs along near ceiling on the floor below.

2 . . . TO BELT WITH KICKOFF . . . As packaged sets move along ceiling-high belt on lower level, they hit battery of electronic selectors. Selectors can tell from location of black dot on each carton which one to guide to which packer.



ONE CONVEYOR SYSTEM can take the varied output of three assembly lines from final assembly to the merchandising area, automatically and without mixup. This is one of the outstanding labor-saving features of Western Electric Company's new plant in Indianapolis. They have two lines operating now.

The system: (1) saves extra conveying equipment that it would take to move the products separately over the distance; (2) minimizes space required for conveyors; (3) saves maintenance.

With more than one product on a single conveyor at one time you might expect some mixups in packaging—or, at least, inefficiency in this operation.

But this has been avoided too. Positive identification of each product is maintained throughout, and simplified packaging is the result of automatic segregation.

Western Electric makes several varieties of telephone sets on the assembly lines. These lines, of course, are fed by subassembly and manufacturing operations.

More than two and a half miles of overhead conveyor serve the production department. The final assembly is on the second of two floors. The merchandising area is on the lower level, at a considerable distance from the end of the assembly lines.

At the end of the assembly lines, workers pack the completed sets in individual cartons and place them on vertical conveyors. These elevating conveyors deposit the cartons on a single overhead belt conveyor. (It's overhead to save floor space.)

Even though cartons containing different types of equipment from the assembly lines are mixed on this conveyor, they don't lose their identity.

Here's why: As the cartons travel upward on the vertical conveyors automatic sprayers mark them with a ¾-in. black dot of electrically conductive paint. The location of this mark on the carton is the key to the identity of the contents.

All the cartons move on the overhead belt conveyor to a spiral wheel conveyor (picture 1). It lowers the set by gravity through the floor to another belt conveyor that runs along near the ceiling of the lower level.

The spiral allows an easy descent without taking up much room. It also provides intermediate storage to compensate for fluctuations between rate of production and rate of packaging.

Products Segregated by Electronic Selectors

On the lower level, the second belt conveyor carries the cartons through a battery of electric-contact finger selectors. Each of the selectors is adjusted to pick up the black dot in one location on the side of the cartons.

When a mark appears in the area of sensitivity of a selector it actuates pneumatic rams which guide that carton off the belt (picture and sketch 2) onto one of another set of spiral wheel conveyors.

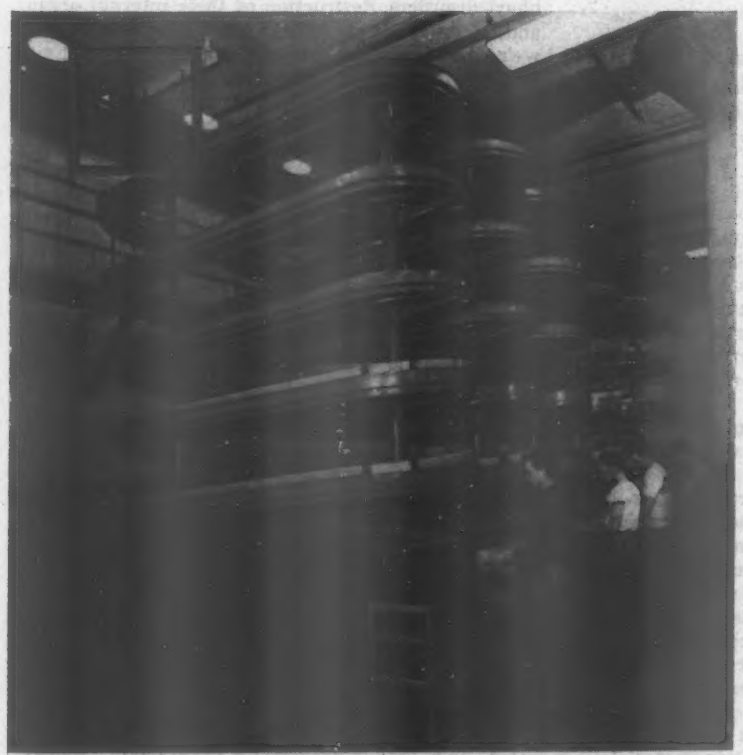
There are six of these spirals to provide adequate capacity for temporarily holding the different types of sets ahead of packaging, one type to a spiral (picture 3). If the production rate by type requires it, operators can set the selectors to shunt sets of one type into more than one spiral.

The controls are on a panel that is conveniently located for the packaging operators.

At the lower end of each spiral is a packaging station. Here the cartons, feeding by gravity to an operator at the base of each spiral, are packed in containers for storage or shipment. Special benches simplify this operation.

After the large containers are filled (but not closed) operators push them onto a gravity roller conveyor. It feeds them to a powered belt conveyor.

On this belt the containers go through the quality control section. There inspectors take random sampling for checkup. Then containers are sealed and ready for shipping or storage.



3 ... WHICH CHUTES THEM TO PACKERS
Electronic selectors segregate packaged sets by type, guide them off belt conveyor (at ceiling height) to these spiral conveyors which chute them to packing line. Here sets are packed in shipping cartons and moved by floor-level roller conveyor to belt conveyor. Latter lifts them up to ceiling height again, carries them off to merchandising area.

RADIOACTIVE MATERIALS

You Can Use Them Safely

• *Radioactive materials are our newest production tools. They're just beginning to come into their own. The big question is: Are we ready for them? The answer—for most of us—is no.*

But you can run your plant as safely with radioactive materials as without.

Here's how—in a recorded interview with Dr. H. E. Tebrock, Medical Director for Sylvania Electric Products Inc. He knows from actual experience. Sylvania is doing it.

1. At present, most companies are not using radioactive isotopes. That being so, why should plant operating executives get excited about them?

Tebrock: I don't say plant operating men need to get excited about the use of radioactive isotopes. But there's a good reason why they ought to get out from under any misapprehensions they may have about radioactivity—based perhaps on some of the "old wives' tales" that are going around. The reason is simply this: *Your readers have to run their plants. And they may wake up soon—tomorrow perhaps—to find they have to contend with radioactive materials of some kind.*

Research progress today is so rapid in the field of radioactive materials that you can't count on being bypassed.

In my own industry—lamps and radio tubes—the use of such materials isn't new, and certainly not uncommon. Thorium, which has been used for years as a "getter," is slightly radioactive. Radium salts and radioactive isotopes have been used in certain types of radar tubes. We are also using uranium and thorium in fluorescent starter switches, and cobalt "60" in certain types of tubes. As research goes on, it is only a question of time before many other production uses will be found.

Now, none of what I'm saying has anything to do with the really big uses of radioactive materials—such as atomic engines for power. Just the less spectacular things are enough to alert most of us to what's coming. Things like radioactive "tracers"—where small quantities of dilute material will identify components or special products.

It isn't true, either, that radioactive materials are so dangerous that they're not likely to be widely used in manufacturing industries generally.

Like everything else, the question of what's dangerous is relative. It's dangerous to make steel or gunpowder, but those are two of our safest industries—safe because the hazards are under control.

Unfortunately, most people don't seem to appreciate this point when they get to thinking about radioactive materials.

What we hear about the atomic bomb is a big factor, of course. You certainly can't compare the effects of an atomic bomb explosion with the effects of radioactive materials in the laboratory or in a commercial production process. With an atomic explosion, you are dealing with many, many times the concentration of materials that you would ever have to deal with in industry, as we see it today. And in industry, of course, you're dealing only with radiation—not blast and heat.

Certainly radioactive materials are dangerous—some of them extremely so. But so are the deadly poisons you use in a plating department. So are degreasers, and punchpresses, and the acids that some plants use by the ton. In fact, so is sunburn, if you get too much of it.

The big difference is that all these hazardous items are an old story. The dangers are well known, and everybody knows they can be controlled. But, as soon as radioactivity comes up, the specter of the unknown is in the picture. People visualize their hair falling out, sterility, monsters for children, blood disorders, destruction of their internal organs, and so on endlessly. The feeling seems to be that we're helpless to do anything about radioactivity. Nothing could be more wrong.

There is no need for any employee to be at all concerned when told he will now be placed on a radioactive production job. We have consulted with our insurance carriers, too, and find they agree—based on close study of our accident and occupational disease record. As a matter of fact, the records are better. We've had no accidents, no occupational diseases whatever, in our radioactive operations.

2. What about those superstitions you mentioned? In actual practice have you had much trouble breaking them down?

Tebrock: No. It has been surprisingly easy. A simple educational program on our part gets the story across quickly. It's done by the foreman or supervisor in charge, and in turn is supervised by the safety engineer who lays down the procedures and policies. We find employees start off with strong reservations in their minds. But, with the proper education and instruction, they quickly get the idea that they are not exposing themselves to any hazards, and need have no fear or concern.

This lack of fear and concern will be just as good as the quality of the instruction, information, and precautions spelled out by the medical department, engineering department, and safety engineer. No better.

Another point: We find that, if you do a good educational job with employees, they carry the message outside the plant. In other words, the employees themselves are your best public relations representatives when you begin using radioactive materials.

3. What about disposing of waste? Can you just throw the stuff out when you don't want it any more?

Tebrock: You certainly can't, and would be in plenty of trouble if you tried it. You don't just throw radioactive materials on the scrap heap. And you can't burn it or toss it into the sewage system without taking definite precautions. Don't forget that anyone using radioactive materials has some clear-cut obligations to the community as well as to those who work directly with the materials.

We like to collect solid waste in special containers, distinct from any others in the plant. These are of heavy steel, or lined with lead to make them radioactive-proof. The waste then can be buried in segregated ground, deep enough so that radiation is well within safety limits. Or it can be carried out to sea, properly weighted and enclosed, and sunk into deep water. Both methods are good.

Liquid waste has to be collected too. You dispose of it either by concentration or by dilution, or both. In concentration, you take out the solid matter first and dispose of it like any other solid radioactive material. What you can't further concentrate you then dilute greatly and wash out into the general sewage system. We find this has no bad effect whatever, provided that the dilution is great enough. That's what is done in laboratories and plants even around a city like New York, where a great deal of radioactive material is being handled. It is perfectly safe because the dilution is so great.

Where radioactive materials are in the form of gases, the problem is somewhat different. We like to collect all gases in a single stack or cylinder, and then "scrub" them. In other words, we collect the radioactive materials by special processes, leaving the remaining gases so mildly radioactive that they can be safely allowed out into the atmosphere.

The disposal of wastes has been, and still is, a major problem. Any firm that is at all likely to find itself involved with radioactive materials would do well to begin to study the waste problem promptly. A head start on a solution will be a really important step in the right direction.

4. What you've said makes using radioactive materials sound like a pretty imposing job, especially this last about waste disposal. Doesn't this largely rule out the small manufacturer who might be considering, say, a defense contract that involves radioactive materials?

Tebrock: No, not necessarily. He'd certainly need special equipment. But that probably would be true of a good many contracts where the manufacturer wasn't making exactly the same product he had always made. In this case, the equipment would just be different—at least the part having to do with the radioactive materials.

The first step your small employer would have to take would be to get a license from the Atomic Energy Commission. He would have to be able to show the AEC that he had a legitimate reason for using radioactive isotopes. And he would necessarily have to prove that he was going to be able to use the isotopes properly and safely. The AEC is a fine and extremely competent organization. The employer would get real cooperation from them. In fact, they even have their own consultants, and a training school available to industry.

He could probably satisfy the Commission by securing the services of a competent consultant, health physicist, or industrial health specialist in radioactivity, who would set up his program for him. The consultant would provide all the necessary precautions for safe handling and safe operation. This isn't too difficult—merely a matter of executing practices laid down by experts. Once the basic program is set, periodic inspection and control will carry it on.

One thing this small manufacturer would certainly have to do would be to appoint some one person to be responsible for the overall control of the program internally. That person should work closely with the consultant. He should have complete authority to see that all radioactive materials are properly and safely used. He should know a good deal about radioactivity. He might even have to be hired specially for the assignment.

To sum it up, I think the small manufacturer can certainly make a go of using radioactive materials in his plant. But I think he ought to go into the venture with his eyes open—as he should into any serious venture. He *must* have complete control over the materials he's using. It will take effort, expense, and a deep sense of responsibility. The possibilities of worker harm, unfavorable public relations, and damage liability are too great to justify any halfway measures. But again I must make the point that *many* hazardous processes involve these problems.

5. What about materials handling problems? Do you need considerable special equipment and methods to handle radioactive materials in production work?

Tebrock: The answer is yes and no. Hot materials have to be handled very carefully, and almost everything has to be special. Diluted materials, on the other hand, fall in a different class, and don't need nearly the care.

To simplify the problem, many firms use what they call a "hot lab," where all incoming radioactive shipments go. These labs are completely fitted out to handle in safety the most active and dangerous materials. Here they are diluted, so they can be more easily and safely handled in research and production work.

In our own company, we have such a central setup where the dilution is done, after which diluted material is sent to various locations within the company, as needed. This plan eliminates duplication of laboratories, and of scarce, highly trained technical experts. It also centers all our major hazards in one location where we can control them better.

As for moving dilute concentrations, it can be as simple as putting them into a special container, probably lead, and carrying or trucking it where it is wanted. The container must be securely fastened, of course, so there is no danger of spillage and contamination of the workplace or the employees. You can see that moving the diluted materials is quite simple Yet it must be done with meticulous care. Granting the care, there's no real problem on the production end. It's the "hot lab" that makes the trouble.

More on next page

How to Protect Your Employees

6. What do you have to do to protect your employees?

Tebrock: Plenty, though the elaborateness of the precautions will vary with the degree of hazard. For highly radioactive materials—the very "hot" stuff—precautions are naturally more detailed and costly than for relatively "colder" materials. In general, the hot materials are confined to special laboratories. What gets to production areas is usually highly diluted.

Broadly speaking, the same basic methods apply, regardless of radioactivity. Only the elaborateness of the methods varies.

The key to everything else is education, of course. As I've already mentioned, we train every person who has anything to do with radioactive materials. Every employee knows his job thoroughly, the hazards involved, and the methods of control.

In addition, there are numerous physical safeguards. Every source of harmful radiations is shielded. In big laboratories that deal with quantities of very hot materials, you will find the thick concrete walls and remote control equipment you hear about in places like Oak Ridge. But in most industrial applications, things don't have to be on such a giant scale. Lighter barriers of steel, concrete, or lead (sheet or bricks) provide needed protection.

Employees naturally wear protective clothing, aprons, and gloves ample to prevent harm. Depending on the type of radioactive material that is used, and other factors, protective clothing may be washable or expendable.

It's important to have as few temptations as possible whereby employees might get radioactive materials into their bodies, To control this, we forbid smoking and eating in all areas. You can never tell when an employee might put a cigarette or sandwich down where it could become contaminated.

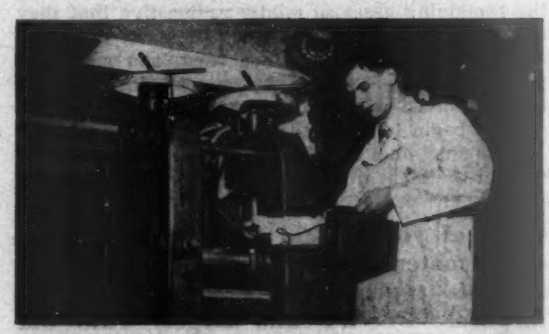
As in so many safety problems, complete personal cleanliness is also a big factor. Everyone working with radioactive materials must scrub hands and other exposed parts of body thoroughly before leaving the area—also change clothes, so no contamination will be carried out.

In addition, we monitor the product as well as the entire area and actually measure the amount of radiation that is given off per hour. We know that all individuals can absorb a certain amount of radiation with no bad effects whatever.

The monitoring job is carried out quite simply. First, we use so-called "film monitoring badges."

HOT MATERIALS, like the isotope cobalt chloride being handled here, are diluted in a "hot lab." Note rubber gloves, remote handling equipment, and lead-lined "hot well" in lower right. Also monitor (background).

CLEANLINESS is the subject of constant emphasis. In some cases, ordinary soaps and hand powders can't be used. This man, for example, is using a special soap that will not "fix" harmful materials in his skin.



"MONITORING" equipment for signs of contamination by radioactive materials is part of regular operating routine. Here a "Beta-Gamma Survey Meter" is being used to check a small rolling mill for radioactivity.

They are just small badges containing photographic film—which is highly sensitive to radiation. The employee wears the badge, sometimes more than one, and turns it in to us weekly so that we can read the amount of radiation to which he has been exposed.

Supplementing this, the entire area—as well as the employee's local area of operation—is monitored by a variety of instruments specially calibrated to register the amount of radiation per hour. You see, we're on the lookout for two things: signs of short-term heavy doses of radiation, and evidences of excessive long-term, slow dosage. Both are dangerous,

COLDER MATERIALS can be handled without the degree of hazard involved for hot. In this picture, radioactive powder is being poured. Big danger here is getting powder in mouth or lungs. Heavy draft in hood prevents this.

TRAINING is constant, and well done. Here Boyd Metz, of Sylvania's Bayside, N. Y., laboratories is illustrating a "Cutie-Pie"—a special monitoring device produced by Sylvania. Other survey meters are on table.

PHYSICAL EXAMINATIONS are give as often as needed. This varies with nature of work and exposure. Here Dr. Tebrock and Nurse Charlotte Sargent are checking a blood sample for Robert P. Gleason, Industrial Hygiene Engineer. Gleason gets into many "hot" areas, and so is checked over frequently and thoroughly. Blood tests are only one of many tests used, but are important because radioactivity effects may show up readily in blood.

but are readily spotted in ample time with the proper instruments.

In addition to all of this, there are, of course, the medical examinations which are a necessary feature of any radiation control program. These are thorough and frequent enough to give positive assurance that nothing could be happening that we'd be likely to miss.

I'll admit that this sounds imposing. But it's all sound. We feel we must be ultra-conservative; we want to have more safeguards than we may usually need, rather than too few, in some areas. The only way to be absolutely sure is to be ultra-conservative.

On the other hand, when you begin to analyze all these precautions, there isn't much there that you won't find in many plants that have no radioactive materials. Where companies have health hazards in their production processes, they often have to take no more precautions for protection against them (control of lead or mercury poisoning, for example). Naturally the type of protection would be different, but the overall health hazard precautions required need be no more difficult to handle.

1 • We made a survey of air demand...

LOCATION, SERVICE, NUMBER OF OUTLETS, AND CONSUMPTION	USAGE	TOTAL OPERATING DEMAND
Dept. #161 & 163, to blow off inside of valves 4—½" orifices (at 80 psi.) = 343 cfm. × 4 = 1372 cfm.	1 orifice for ½ minute of each minute	171 cfm.
Dept. #181, sand blast cabinets, 5 hours out of 8 4—⅜" orifices (at 80 psi.) = 193 cfm. × 4 = 772 cfm.	1 orifice for 1 minute of each minute	193 cfm.
Dept. #150, moulding machines, intermittent use 14—1" orifices (at 80 psi.) = 1371 cfm. × 14 = 20,194 cfm.	4 orifices for 1 second of each minute	92 cfm.
Foundry vibrators and air guns 21—⅛" orifices (at 80 psi.) = 21.4 cfm. × 21 = 449.4 cfm.	One tenth of total operating at any one time	45 cfm.
Leak testers 65—1/16" orifices (at 80 psi.) = 5.36 cfm. × 65 = 348.40 cfm.	One tenth of total operating at any one time	35 cfm.
Factory air guns 457—1/32" orifices (at 80 psi.) = 1.34 cfm. × 457 = 612.38 cfm.	One fourth of total operating at any one time	153 cfm.
Other buildings Various apparatus, total demand 1118 cfm.	One fourth of total operating at any one time	279 cfm.
	Total Demand	968 cfm.

My Best Maintenance Idea — How I Put It to Work

You can make facts and figures talk loud enough to get management's approval.

This manuscript won the $100 second prize in FACTORY's Maintenance Idea Contest. Prizes were awarded at the Second Annual Plant Maintenance Show. (See page 97, February issue.)

By HENRY M. BRADLEY
Plant Engineer, Manning, Maxwell & Moore, Inc.
Bridgeport, Conn.

MY PROBLEM was how to present facts and figures to management in a way that would justify a request for a new air compressor.

It had become apparent that four compressors now at different locations could not meet the increased demand. Also, we expected to centralize all compressors in a new plant being built.

A. We made a survey of air demand. We analyzed the entire plant to determine the number of air outlets and their demand. We wanted to make sure the air system supplying air guns, paint spray equipment, air chucks, and so on, was not out of bounds. There's a tendency over a period of years, you know, to pile up too many outlets. You add one here, another one there, for equipment installations and alterations. But you seldom take any out. So we checked all requirements and cut out surplus outlets. This we did by timing equipment or compressor with a stopwatch.

Also, we clamped down on air consumption in other ways, such as by tightening up the pipelines for leaks, and replacing open jets on machines with a

2 • We inventoried air-compressor equipment...

DESCRIPTION & LOCATION	EQUIPMENT NUMBER	CAPACITY CFM.	WORKING PRESSURE PSI.	YEAR PURCHASED	ORIGINAL COST	BOOK VALUE—1950	ESTIMATED RESALE VALUE	NECESSARY REPAIR
1—75 hp., Mfr. A, Building 2	2035	350	100	1939	$2655.45	$1235.97	$1500.00	....
1—25 hp., Mfr. A, Building 2	2907	250	100	1943	$2305.72	$1553.47	$1500.00	....
1—150 hp., Mfr. A, Building 1	1765	750	100	1936	$6106.07	$2690.51	$3500.00	$2947.00
1—100 hp., Mfr. B, Building 2	5012	460	100	1949	$4121.81	$4032.16	(will keep)	....

3 • We compared old and new operating costs...

WATER

Consumption is 2.5 gallons per 100 cfm. delivered.
Cost is $.01 per 100 gallons ($.0001 per gallon).

Old setup:—3 compressors, 250, 350, and 750 cfm., totaling 1350 cfm.
New setup:—1 compressor, 913 cfm.
Difference:—437 cfm.
Saving per year:—437 cfm. × 2.5 × 8 hours × 300 days × $.0001 = $262.20

POWER

Cost is $.02 per kwh. One hp. per hr. = 0.7457 kwh.

Old setup:—3 compressors, 25, 75, and 150 hp., totaling 250 hp.
New setup:—1 compressor, 175 hp.
Difference:—75 hp.
Saving per year:—75 hp. × 8 hours × 300 days × 0.7457 × $.02 = $2684.52

timing device which is actuated by operator's foot pedal to open the nozzle only intermittently as needed.

Results of this survey were condensed into the summary of minimum requirements shown in the form opposite. As an operating check on computations we installed a flow meter in the main compressed air line. This showed a total intermittent demand of 875 cfm., as compared with a computed total demand of 968 cfm.

B. We made an inventory of existing air-compressor equipment. This is shown above. The inventory included shop number, capacity, pressure, year purchased, original cost, and present book value. It also showed resale market value on units we were considering for disposal, and cost of repairs if needed.

C. We planned a new setup. It was obvious that too many smaller units, when centralized, would give us inefficient operation. Based on a maximum computed demand of 968 cfm., and allowing for growth, we figured to install a new compressor of about 900 cfm. capacity, and retain only the one old compressor rated at 460 cfm. The new compressor would handle normal loads; the old compressor would serve as a standby for light loads.

D. We calculated 'old' and 'new' operating costs. They are shown above. Since the old 460-cfm. compressor appeared in both setups, we merely had to balance the proposed new compressor against the three old units we recommended for disposal. Water and power savings added up to $2946 per year in favor of the new.

E. We told management the net costs—investment and annual savings. The story was brief:

Money saved each year in operating costs	$2,946
Money saved in repairs	2,947
Money salvaged in sale of three compressors	6,500
Total Initial Savings	$12,393
Cost of new 175-hp. compressor, 913 cfm.	$14,093
Net initial investment	1,700
Annual savings after first year	$ 2,946

On the basis of these figures, management readily agreed to the new plan. Incidentally, actual initial savings were higher because we found the compressors we sold were worth more than we had originally estimated.

CAMERA TOUR • TELECHRON INC.

PHOTOGRAPHS BY DICK WOLTERS

Better Product at Lower Cost With Statistical Quality Control

• Two companies with outstanding reputations for the jobs they are doing in the field of statistical quality control are Telechron Inc. and Monsanto Chemical Company. One makes clocks, motors, and timers. The other, in general, makes chemicals and plastic for industry.

Dr. L. M. Debing, laboratory superintendent of Monsanto's Plastics Division, Springfield, Mass., wanted to see "how it's done" in a different industry. So he spent a day touring the Telechron plants in Worcester and Ashland, Mass., with J. A. Robertson, Telechron's quality manager. FACTORY's camera was invited to go along. You're invited, too.

1 TELECHRON'S ROBERTSON

Host Robertson: We're delighted to have you come over. Welcome to Telechron.

Guest Debing: I'm glad to have the chance. Monsanto believes in statistical quality control, just as

3 QUALITY CHECK ON VENDOR'S PARTS

Guest Debing: Does this file show the performance of your vendor's incoming parts?

Host Robertson: Yes, it gives the quality history of every supplier. Some suppliers use an outgoing-inspection plan that meets our standards. We can be safe with a minimum of sampling of their products. Obviously, critical parts are checked against much "tighter" sampling plans than we could afford to use on noncritical parts. A few standard plans fit most parts and special cases are noted in the file.

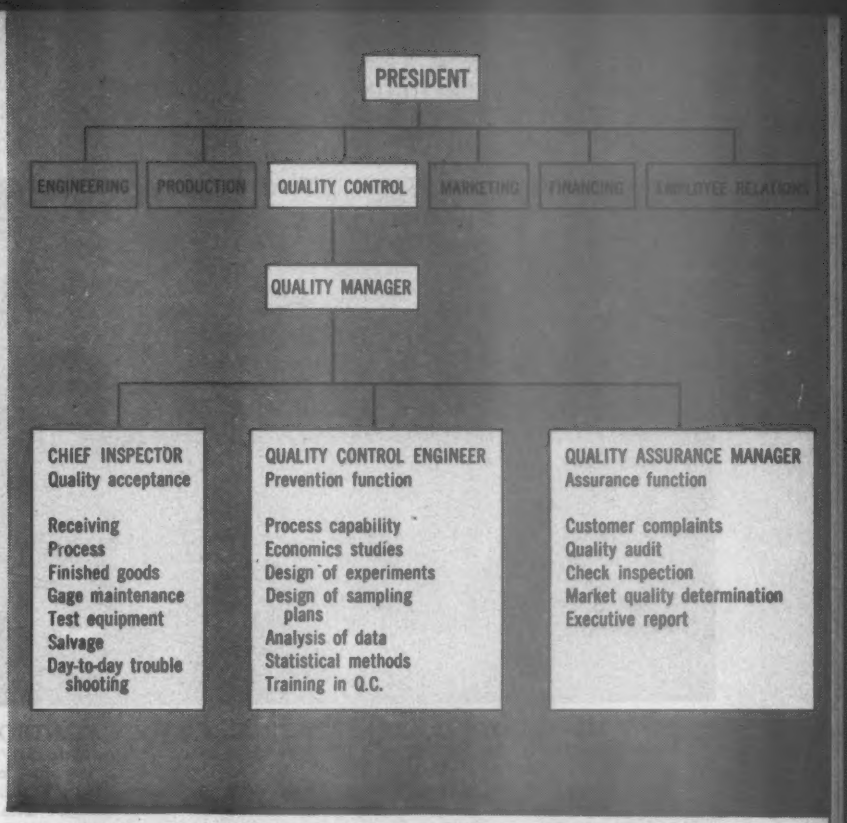
4 SPOT CHECK ON ASSEMBLY LINE

Guest Debing: What kind of sampling plan and inspection schedule do you use for these spot checks?

Host Robertson: The plans are different for different parts. If the assembly operator is likely to see a defect, we spotcheck just enough here to be sure the process doesn't go haywire. But if later detection—except at final inspection—is unlikely, or if correction is expensive, we use a full sample. Except with a new job or new operator, we rely on the operator to do most checking.

GREETS MONSANTO'S DEBING

you do, and I'm interested to see how you apply it to operations totally different from ours. Did you have the same problem we did—keeping methods simple and flexible, to avoid being over-involved in statistical details and formulas?



2 QUALITY IS REPORTED RIGHT UP THE LINE

Host Robertson: Sure, we had to avoid the "statistical trap." I think this chart will tell you, in part, how we did it. Statistical controls are just a part of the complete quality job.

Guest Debing: Is this a new setup—quality reporting to the president?

Host Robertson: Relatively, yes. We started in February, 1950. We found quality cut across too many areas to stay within manufacturing.

5 INSPECTOR LOOKS AT OPERATOR'S REPORT OF DEFECTS

Host Robertson: Here's what I mean about operators' checking themselves. The girl handles the parts anyway, so she can spot most obvious defects without extra handling. She indicates the nature of the defect on her tally sheet. When the roving inspector comes around, he merely looks at the tally sheet. That will tell him if corrective action is needed, or if he should start making more frequent checks.

Guest Debing: I gather from that the roving inspector doesn't rely exclusively on the "statistical limits" of control charts to determine his actions.

Host Robertson: Correct; only in rare cases do we use control charts at individual workplaces. They're too complicated for most operations.

6 CONTROL CHART

Guest Debing: I see you do some control charts.

Host Robertson: Yes. We run them for assembly lines, and some selected operations. A few well-planned charts are essential to good statistical quality control, but we are careful not to overdo them. They get results at reasonable cost.

More on next page

CAMERA TOUR: TELECHRON INC. ... begins on page 88

7 HOW MUCH DOES GOOD STATISTICAL QUALITY CONTROL COST?

Host Robertson: Dr. Deming, I'd like you to meet our president, Mr. A. F. Fisher.

Guest Deming: Perhaps you'll tell me how Telechron Inc. decides how much it can afford to spend on quality control.

President Fisher: In a competitive market, we must have low cost for a quality product. But we're also in a mass market, so we must have quality production. Naturally, we want the highest quality consistent with low cost and high production. Our objective is to maintain a balance within the cost-quality-quantity relationship. That's exactly what Robertson and his staff are doing. And I might add they are doing it very well. In actual practice, our investment in quality control has meant that Telechron gets more salable units at lower net cost per unit.

9 FUNCTIONAL INSPECTION AT ASSEMBLY IS GOOD PRACTICE

Guest Deming: Does assembly inspection work the same as in the parts departments?

Host Robertson: In clock assembly, for example, 100% inspection—both functional and visual—is good business. In each assembly line, as you can see, we have inserted a functional test station. Here, we check actual operation of all assemblies before they are enclosed. Obviously, it isn't necessary for the girl to stop to gage every dimension. After all, critical parts have already been subjected to stiff sampling at the point of production. If good parts, properly assembled, pass this functional test, we know that the product will work right for the customer and the customer will be satisfied.

However, since the assembly operators have to handle every part, we have, in effect, a 100% visual inspection—and the girls take this responsibility seriously. They know as well as we do that the customer will be almost as unhappy about a flaw in appearance as in faulty operation.

8 MORE SALABLE UNITS

Guest Debing: Can you prove that? More salable units at lower net cost?

President Fisher: I think so. This management report shows percentage of defectives reaching the end of assembly lines were cut 50% in 4 years. And inspection-to-direct-labor cost ratio also was cut 50% in the same period.

10 QUALITY ANALYZER

Guest Debing: Are these some of the quality analyzers I've heard about?

Host Robertson: Yes, indeed. As units come off the line, they go down an automatic elevator to final inspection. Any time a defect is found, the inspector pushes a button indicating the cause. A pointer moves to the red area on the board any time the statistical limit of percentage defectives is exceeded

11 100% SAFETY FACTOR ON MACHINE TOLERANCES

Host Robertson: In the screw machine department, we have made studies to find out just what tolerance we can hold on a given machine. That means the designers know what they can specify. In loading work on a machine, we try to provide a safety factor of 100%—that is, plus or minus 0.002 we put on a machine that can hold to 0.001. Sometimes we accept 50%, but never less.

We can do the same thing with most punching, especially where we are using cemented carbide dies. But variations are so great in bending and drawing that we don't yet have enough data. We are engaged in collecting it now.

More on next page

12 BAD MOTORS MAKE CLOCKS NOISY

Guest Debing: Why is it that you test only motors here in the soundproof room?

Host Robertson: We found that noisy clocks and timers are almost always caused by noisy motors. So we do some rigorous testing of the motors—after they have been run-in on racks. We do some testing of assembled clocks for noise—as you'll see in the "audit" room.

13 EVERY CLOCK AND TIMER GETS . . .

Guest Debing: Do you make an operating test of every finished clock and timer?

Host Robertson: Yes, we do. The final inspectors, of course, check such things as operation of reset and alarm-set. We use this run-in test to check that the mechanism isn't locked in some way, or that the timer hasn't been miswired to prevent operation. We also switch the current on and off

14 STETHOSCOPE CHECKS NOISE

Guest Debing: I thought you were joking when you said units were given a *complete* going-over here at quality audit. Checking for noise with a doctor's stethoscope is a rough test.

Host Robertson: It's the best way to identify various faint sounds in a noisy manufacturing area.

15 CHEM LAB HELPS KEEP QUALITY HIGH

Host Robertson: I'm sure this chemical laboratory doesn't compare with a chem lab at Monsanto, Dr. Debing, but it shows how engineering contributes to quality control.

Guest Debing: Having thought of clock and timer making as primarily metalworking, I'm a little surprised to find one.

Host Robertson: The boys in the lab help us in many ways, but their two big jobs are materials and lubricants. Getting a motor lubricant that will last for years is a tough job.

Better Product at Lower Cost With Statistical Quality Control

... A FINAL RUN-IN OPERATING TEST

to be sure of the self starting, and to see that the red "reset" button flashes to show that the current has been turned off.

However, this doesn't end our quality control. Even after packaging, some units are returned for a "quality audit." There they are not only checked for operation, and appearance, but also the cases are removed to permit a check of the positions and clearances of parts.

Guest Debing and Host Robertson, weary, satisfied, and on time.

16 ENLARGER CHECKS DIE QUALITY

Guest Debing: I imagine this enlarger is used for checking dies more than pieces from production. Is that a quality control function, too?

Host Robertson: Yes, it is. If we are succeeding in our program, I think the prime reason is that Telechron management has a concept of quality control as a complete job—right from design and engineering through packaging and shipping.

• When we talked to Jim Robertson about the application of statistical controls in the Telechron Inc. quality program, he told us a little story we think has a big point:

Statistical quality control is like the fabled doughnut. If you want to be successful, you have to keep your eye upon the doughnut and not upon the hole. In just the same way, quality can be built around statistical controls—but you have to keep your eye on the quality and not on the statistical controls.

As Jim told his guest, statistical control is just one aspect of the whole job. Statistics are used mainly to provide facts instead of opinions as a basis for making a sound approach to the planning of a quality program.

Proof that the quality department of Telechron Inc. is doing a real job is found in the monthly "management reports" Robertson sends to President Fisher. These reports give heavy weight to the results of the quality audit. Samples for the audit are chosen at random from inspected, packaged units on the shipping dock.

Robertson likes to refer to the quality audit as his "report card." Unlike some engineers, Jim doesn't rate honors in his statistics and then proceed to flunk his economics. He's doing a well-rounded job of quality control without allowing the cost of getting statistical data to disturb the ideal cost-quantity-quality-balance.

ROLE-PLAYING SESSIONS HELP SUPERVISORS . . .

Supervisors act out roles of "foreman" (leaning forward) and "experienced operator" (sitting). Here foreman makes mistake of being too abrupt. "I can see why your incentive earnings are low," she says. "Your hand is too close to the needle and you're pushing the cloth. That makes stitches uneven." She grabs the cloth and shows the operator how to do it. The operator gets mad, says her way is all right. Result: Bad approach leads to argument.

REFRESHER TRAINING HELPS US

Everybody talks about the need to train green foremen and workers. But you don't hear much about the even greater need to *retrain* experienced people. Yet the backbone of your production program is your existing work force. And if you really want to produce more and waste less, your best bet is to boost the operating efficiency of the "old reliables"—who sometimes aren't as reliable as you think.

Here's how one company is doing it. Its refresher program is simple, fast-moving, and inexpensive. It puts the emphasis on retraining experienced workers right on the job. It uses the old multiplier technique: One consultant trains 20 department heads; 20 department heads train 200 foremen; 200 foremen train 2000 workers.

BY RICHARD KISLIK
The Maiden Form Brassiere Company, Inc., Bayonne, N. J., and
ALFRED R. LATEINER

RESEARCH SHOWS that 80% of all waste and inefficiency is due to mistakes by people and only 20% to other factors. Our own experience at Maiden Form confirms this finding. It also shows that 95% of the human errors that lead to waste and inefficiency are made by *experienced* employees and only 5% by the minority who are "new."

. . . MAKE RIGHT APPROACH IN RETRAINING WORKERS

"Foreman" and "operator" try role playing again, after listening to discussion by group of why the approach was wrong. This time the foreman is more careful. She asks operator if she can help her increase her bonus earnings. "I hope so," says the operator. "I've been having rejects due to uneven stitching." With this start, they work together to figure out the right way to feed cloth (above). Operator agrees to try it.

WIN OUR WAR ON WASTE

Out of these two facts came our decision to set up a refresher training program aimed at concentrating our foremen's efforts on correcting the mistakes of experienced operators.

Like many firms, ours has been trying for years to help its supervisory force to grow and develop. We have had a going work simplification program since 1937. We have run numerous projects like Job Instruction Training and Job Relations Training. We feel that, for the most part, our foremen know what to do, as the result of steady effort to increase their knowledge, skill, and understanding. Except for new foremen, the real problem is to get better *application* on a regular basis of what they already know.

That's why just saying, "Let's have a training course," isn't the answer, as we see it. There has to be a good reason for such training—something definite and clearly related to the foremen's jobs, and the jobs of those under them. We found that reason in the waste reduction campaign that has been going on in Maiden Form plants for over a year. So we tied our whole refresher training program right into that campaign.

We were helped in doing this by the fact that we have never defined waste in the narrow sense of scrap alone, or product waste. Close inspection and scrap-conscious design have reduced that kind of waste to a minimum.

To us, waste means such things as waste of effort, space, manpower (turnover, for example, costs us $300 a person), downtime, delay in

REFRESHER TRAINING . . . begins on page 94

material delivery, and grievances (or, as General Manager M. Rosenthal puts it, "waste of happiness because of misunderstanding"). This broad definition of waste has given us a foundation for a sound and flexible refresher training job.

RESULTS. Naturally, figures on the results of refresher training reflect to some degree the impact of other features of our waste control program. No one factor can be given all the credit, but we are sure the training has played a big part. Here are some examples of what has happened:

In plant "A" output per employee has increased 10% since August. This plant is now running a 6-day week, but the figures have been adjusted to take this into acoount.

In plant B, the amount of faulty work has decreased 30%. To us, quality is of the greatest importance, and a substantial reduction in faulty work also increases customer satisfaction.

In plant "C" labor variance (all off-standard items, such as downtime, repairs, credits) has decreased by 5% in dollar amount while the total output has remained constant.

Since we have almost 100% wage incentive coverage, with high levels of efficiency, we think these figures are impressive.

In addition there are other benefits. One specific case involves the savings of thousands of dollars. During a recent storm the storage basement of a plant became flooded. There was no loss because all the stock was resting on wooden platforms. The supervisors, because of the training sessions, were alert to waste-producing conditions and had taken corrective action.

This is not a "one-shot" benefit by any means. The problem of proper storage of fabrics to prevent soiling and damage is ever present with us. It is under better control than ever as the result of what has been done recently to retrain our "old-timers."

HOW MAIDEN FORM'S REFRESHER TRAINING PROGRAM WORKS

The program was worked out in detail by a committee of seven key operating executives, with the help of a consultant.

Manual. The end-result was a training guide (reproduced in full, beginning on page 248), called *Waste Reduction Training (Job Instruction Training Review)*. This was used by the 20 department heads for the basic refresher training course and the role-playing conferences.

It covered Job Instruction Training, of course. But it also put strong emphasis on human relations in the everyday job situation. This was part of our plan, since we felt that the *approach* used by the foreman in giving remedial training to experienced workers was a critical factor. The old employee doesn't react well to criticism and correction unless it is done skilfully.

We also felt we couldn't rely on general statements to drive home the human relations ideas we had in mind. So we got as specific as we could. In the manual and the conference sessions, we concentrated on specific "how-to-do-it" tips on how to approach experienced workers to get the best possible reactions.

Role Playing. To drive these practical tips home, we provided for role playing as part of the training sessions. Everyone attending the sessions must participate either as an "experienced operator" or as a "foreman."

Those who play the role of operators pick out common errors made by operators under them, and try to act like typical operators when errors are discussed with them. Those who play the role of foremen must, of course, use the proper job instruction and human relations approaches since they appear before a vocal and alert audience of their fellow-supervisors.

At the end of each role-playing situation, the whole group talks over what happened, and analyzes the strong and weak points of the foreman's approach. The groups are small — six to eight people — so everyone gets ample chance to participate in the sessions.

"Multiplier" Plan. The aim of the Maiden Form program is to spread the benefits of refresher training from 20 department heads to 200 foremen, and then to 2000 operators. This is commonly called "multiplier training," for reasons that are obvious.

To this plan we added one more ingredient. We felt we would get better results if the 20 department heads ran their own conferences for those directly under them, instead of depending on others. To do this, we had a consultant put the department heads through the full refresher course, and coach them in the proper use of the manual—a relatively easy job, since all were trained conference leaders.

The consultant then retired into the background, and the department heads took over. They ran the conferences. They followed up to see that their foremen were actually doing what they had talked about and practiced during the training sessions.

To us the idea of having the department heads give their own subordinates refresher training has several important advantages:

1. The line of responsibility is clear all the time. There's no misunderstanding about who is responsible for the quality, efficiency, and output standards (set during training sessions) when the "boss" in person does the training.

2. Follow-up is direct and fast. The boss knows exactly what happened in training because he made it happen. The foremen know, too, since they got the story right down the line. And furthermore, they know that the boss knows.

3. Interest remains high. Department heads and foremen work as a team. The project is theirs, and they can quickly spot results or lack of results as they work together. Supervisory control of errors is quickly applied when workers endanger standards of quality, quantity, and cost.

To get the full text of the Maiden Form refresher training manual, turn to page 248.

We Mobilize for Freedom

FIRST OF A SPECIAL SERIES

The Defense Production Problem

To win out in the struggle for freedom into which the Russian Communists have plunged us we must do at least four things. We must:

1. Speedily carry through a program of defense production which, at its peak, is scheduled to take about one-fifth of our national output.

2. Pay for this program as we go, by methods that will enable us to maintain the effort for an indefinite period – as long as may be necessary to insure peace and security.

3. Manage intelligently and endure intelligently a set of direct government controls which, in certain critical departments, will put our national economy for a time in a hateful straight jacket.

4. See that these emergency controls are not fastened upon us permanently thereby presenting to our Soviet antagonists a major victory for collectivism on our home front.

This is the first of a series of editorials designed to present in the simplest terms these key aspects of our struggle to preserve our free institutions.

A Staggering Task

The magnitude of the defense production job staggers the imagination. Over the next year it calls for a larger volume of goods and services than the 20 million people of the states of New York and New Jersey will use for all purposes. The (London) TIMES has observed that, taken alone, the increase of defense expenditures which has been budgeted for the federal government's coming fiscal year (about $30 billion) "is in itself not far short of the total national income of the United Kingdom."

Yet so powerful is the production machine created by free American enterprise that, at the scheduled peak, the defense program will take only about one-fifth of our total national output. The exact form and dimensions of the program will, of course, be hammered out on the anvil of public and congressional debate. But the President's recent estimate of an annual rate of expenditure of $45-55 billion for defense by the end of this year may well turn out to be somewhere near right.

To meet even these vast requirements of defense production we are in better shape technically than we were when we started to prepare for World War II. Our industrial plant and equipment is greatly improved. Over $65 billion has been invested in it since V-J Day. Our working force is about eight million larger than it was ten years ago and much better trained.

The difficulty, and it is a very serious economic difficulty, is that we must fit the defense program into a productive machine that has been almost fully extended to meet the needs of a booming civilian demand. The present plan is to step up defense production during 1951 from about 7% to about 18% of our total national output. Because there is relatively little slack in our economy, this means that civilian production at the outset must

be cut back as defense production is stepped up.

The cut-back of civilian goods must be especially severe in the case of products made of metal. This is particularly true of goods that use scarce strategic metals such as aluminum and copper. Of our total defense production program, about half will go for "military hardware" – airplanes, guns, munitions, tanks and the machinery to make them. By the end of 1951 defense requirements are scheduled to absorb most of the metalworking production not required for essential construction and for the spare parts necessary to keep existing equipment running. For a time at least, there will be a sharp cut in the supply of new metal products available to civilian consumers. The defense squeeze on both materials and manpower will also cut sharply into housing and other civilian construction.

For the Short Run — Controls

In the short run there is no answer to the problem of meeting defense production schedules except controls. Sharp reduction of non-defense expenditures by government is essential and would help greatly. But the basic fact is that we cannot increase our total production fast enough to meet immediately both civilian and defense requirements.

Controls are needed, therefore, to switch resources from civilian to defense production, and at the same time prevent the combined demand for critical products from sending prices right through the roof. In the case of many scarce strategic metals such as nickel, copper and cobalt, the task of increasing output is especially difficult because our limited supplies are tucked away deep in the earth in many quarters of the globe.

For the longer pull – and that is what we must face – there is another answer to our defense production problem that is infinitely better than controls. And this time, in contrast to World War II, it is all-important that we get the right answer to our defense production problem for the longer pull and that we get it right now. In World War II we geared our economy to meet the requirements of a relatively short and decisive conflict. Now our leaders, however they may differ as to methods, are well agreed that, at best, "the conditions under which we labor may persist for ten, fifteen or twenty years." That is General Bradley's phrase.

For the Long Pull — More and Better Production

For this longer pull, the constructive answer to our problem of defense production is clearly more and more efficient production all along the line. It is true that overall we now have the most efficient industrial establishment in the world. But, even so, much of it is far short of attainable efficiency. Some plants using up-to-date equipment and methods are as much as six times more efficient than others in the same industry that are lagging in modernization.

Our Director of Mobilization, Charles E. Wilson, has clearly in mind this problem of increasing our industrial efficiency. The first step in his job, as he conceives it, is to get out an adequate supply of weapons to equip the army, navy, and air forces already mobilized or in process of organization by us and our allies. The second step is to make sure of our capacity to produce both "military hardware" to meet any increased requirements and the maximum possible volume of goods for civilian use.

In concentrating on more and more efficient production, Mr. Wilson is squarely on the beam. We can attain his objective – by sustained effort on the part of each one of us backed by up-to-date industrial methods and equipment.

If we do that, we can maintain indefinitely an adequate defense effort and at the same time enjoy a standard of living higher than any other in the world.

Additional production and more efficient production are our surest safeguards against our two most menacing enemies on the home front – the deadly inflation that can destroy our free economy, and the strangling government controls that can destroy our political freedom.

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How to Build

A MAINTENANCE PROGRAM NOW TO FIT THE NATIONAL EMERGENCY

By CHARLES C. WINSTON and STEPHEN C. HAMLIN
Senior Staff Members, Wallace Clark & Co., Inc., New York

You can cut costs, save manpower, and get out more production with a top-notch maintenance setup. It will give:

BETTER WORK CONTROL. *You clamp down on unnecessary work. You are sure that you do the job once and do it right—saving man-hours for other maintenance that needs to be done.*

BETTER WORK PLANNING. *You cut down the time craftsmen waste in waiting—and so save manpower. You reduce rush jobs and overtime.*

BETTER PREVENTIVE MAINTENANCE. *You cut production downtime for emergency repairs. Thus you don't waste production workers' time, and you boost plant output. You work your way out of repetitive repairs, saving precious manpower and materials.*

BETTER SPARE-PARTS CONTROL. *You can gear your inventory to your needs—having enough of everything, not too much of anything, and no clutter of obsolete parts.*

BETTER WORKER MORALE. *You can get your production and maintenance staffs pulling together as a team. But you can't do it with a helter-skelter maintenance organization, loose methods, and inefficient equipment.*

ARE YOU SURE that the maintenance job in your plant is good enough for the trying times ahead? Good enough to keep your plant running at top efficiency in spite of shortages of new machines, equipment, and supplies?

Or do you wonder how good your maintenance setup *really* is? Whether you have a preventive maintenance system that can in fact prevent breakdowns before they happen? Whether you're getting the most out of the maintenance men's time? Whether the jobs that ought to be done get done—in time?

Or are you pretty sure your maintenance setup isn't what it should be? Do you wonder where it needs improvement—and where to start?

This report—on the next 11 pages—will give you the answers. It's in two parts:

1. A 32-question test on the details of your maintenance program. If you can honestly answer *yes* to 24 questions, you're in good shape. If not, you'll want to study.

2. A six-phase guide on how to set up a real maintenance program. You may want to start from scratch and do the whole job. Or you may want to strengthen your program at the points where the test shows it's weak.

More on next page ▶

HOW TO BUILD A MAINTENANCE PROGRAM NOW . . . begins on page 97

32 QUESTIONS TO TEST HOW GOOD A MAINTENANCE JOB

	YES	NO
AUTHORIZING MAINTENANCE WORK		
1 Do you have clear-cut work request and work order forms and procedures?	___	___
2 Is the work classified as to repairs, moving and rearrangement, new work?	___	___
3 Is it tougher to get approvals for new work or moves than for repairs?	___	___
4 Does the work request have a "date wanted" space which is used for realistic dates and not for "at once," "soon as possible," "rush," and so on?	___	___
5 Do 90% or more of your jobs start after formal approval rather than after a phone call with a catch-all number and paperwork to follow?	___	___
PLANNING AND SCHEDULING WORK		
6 Do you formally estimate every work order in terms of man-hours by craft for each operation?	___	___
7 Do you list the materials required and check their availability before the job starts?	___	___
8 Is the job priority established by "date wanted" and not by "the squeakiest wheel gets the grease" method?	___	___
9 Is an advance day's work laid out for each craftsman each day?	___	___
10 Do your foremen have tomorrow's plan developed for them and in their hands today?	___	___
11 Do you keep progress charts on your big jobs?	___	___
TOTAL	___	___

	YES	NO
12 Do your little jobs get completed and not postponed for the big ones?	___	___
13 Can you promise completion dates and meet them?	___	___
PREVENTIVE MAINTENANCE PROCEDURES		
14 Have you equipment records for *all* equipment in your plant? Do they show original and upkeep costs for each item?	___	___
15 Do you analyze maintenance costs for each item of equipment and alter design to eliminate repetitive repairs?	___	___
16 Is every piece of equipment inspected at some fixed interval?	___	___
17 Is a work order initiated for repairs as soon as you discover a repair is needed?	___	___
18 Is lubrication work laid out on a route basis? Are oil changes "called up" systematically by a card file?	___	___
WORK LOAD MEASUREMENT		
19 Do you know your man-hour backlog by craft? Is this review made at least once a month?	___	___
20 Have you enough data to force top management to select what jobs must be delayed if new "rush" jobs are inserted?	___	___
21 Can you predict the need for manpower additions or cutbacks? For overtime? For subcontracting?	___	___
22 Do you know how many hours are reserved for routine inspection tours?	___	___
TOTAL	___	___

YOUR PLANT IS DOING

	YES	NO
MAINTENANCE STORES CONTROL		
23 Are your maintenance stores the responsibility of the maintenance department rather than the purchasing department or the accounting department?	___	___
24 Do you have controlled stores levels?	___	___
25 Have you reviewed your stores item by item during the last six months and disposed of obsolete items?	___	___
26 Do you know within 20% how much you should have invested in maintenance stores?	___	___
RELATIONS — MANUFACTURING AND MAINTENANCE		
27 Does your maintenance executive report high enough on your plant organization chart to make sure production does not win all of the arguments?	___	___
28 Do you consider maintenance men as human beings and not ask them to work Christmas, New Year's Day, Sundays, and when the plant is closed for vacations?	___	___
29 Do you schedule any downtime for repairs and overhauls of production equipment?	___	___
30 Do you operate your equipment at designed capacity and not at 150% or 200%?	___	___
31 Do your maintenance and operating supervisors have meetings at least once a week to discuss plans, progress, and problems?	___	___
32 Do you allow enough clerical help in the maintenance department to take care of the necessary paperwork?	___	___
TOTAL	___	___

TOTAL ___ ___

How GOOD A JOB of maintenance is *your* plant doing? You can get the answer from the checklist at the left. It contains 32 searching questions about the details of your overall program. If you can check 24 or more of them with a firm *yes*, your plant passes the test.

Watch your scoring, though. Don't be like the fellow we know who recently scored himself on a similar list. He gave himself a 99. Sounded great. But when we went over the maintenance operation with him we found his definitions were much too broad. His idea of what constitutes good planning, good scheduling, etc., differed widely from ours. We found we weren't talking the same language.

For example, his "plans" were right out of his or his foremen's heads, each plan going to some 20 or 25 craftsmen, and from job to job. He made practically no advance preparations for materials, special tools, or fixtures. There was little advance notification where other crafts tied in with crafts already on the job.

His "schedules" were for the big jobs, and then only in large bites. There wasn't nearly enough detail to tell what crafts were involved, how many men were needed, where required, and when.

His "preventive maintenance" boiled down to permanent assignment of a number of craftsmen to a group of buildings to carry out inspection and lubrication duties. He admitted there wasn't much time for follow-up to see that all equipment got its fair share of attention. Occasionally his service men were "borrowed" for rush jobs.

His "work order" consisted of a preprinted memo pad on which he, his foremen, and the operating supervisors recorded the work to be done, in vague terms. They defied intelligent interpretation by anyone but the originator.

Sure, this was an unusual case. Our friend was something of a wishful thinker. His plant's practice simply wasn't as good as he wished it was.

And to make sure *you* aren't making a similar mistake, it might be a good idea—in the light of this caution—to check your own score again.

Best still, check your score *after you have finished reading* the "Six-Phase Program for Better Maintenance" that appears in the next nine pages. Chances are you'll revise your standards.

Turn the page to read FACTORY's newest contribution to the cause of good plant maintenance.

Begins on page 97

6-PHASE PROGRAM FOR

1 WORK ORDER

CLASS OF WORK	✓	CODE	ACCOUNT NUMBER
REPAIR	✓	M	LABOR
ALTERATION OR IMPROVEMENT		A	MATERIAL
RENEWAL		E	ISSUED TO / DATE 8/8/50
NEW WORK			EQUIPMENT NO. 350
			WORK ORDER NO. 1905

DESCRIPTION OF WORK: REMOVE, REPAIR, AND REPLACE DAMAGED SHAFT, AND REPLACE MAIN BEARINGS, PUMP #350, LOCATED IN BUILDING #29, 2ND FLOOR, NORTHEAST CORNER

REQUESTED BY J.B. Stearns | DATE WANTED 8/21/50 | COMPLETED BY / DATE

POSTED TO EQUIPMENT RECORD CARD — BY — DATE

REASON (INCLUDE IF EST. COST IS OVER $100 AND NOT IN BUDGET)

BUDGET ITEM NO. | CHECKED BY | ESTIMATED BY

COST	LABOR	MATERIAL	TOTAL
BUDGETED			
ESTIMATED			

PROJECT APPROVED BY (INITIAL)

MAINTENANCE ENGR.	FDM	STEAM & POWER ENGR.	
OPERATING ASST. SUPT.	WEC	DIVISION SUPT.	
OPERATING SUPT.		CHIEF ENGR.	
OUTSIDE MAINT. SUPT.		PLANT MGR.	
MECHANICAL SUPT.		GENERAL MGR.	

PHASE 1 · AUTHORIZING MAINTENANCE WORK

First step is to insure that the production and maintenance departments use a formal work order to specify the work that is to be done. And execute the work order *before* the work is undertaken.

The work order (Figure 1) should be made up in several copies—one for the accounting department for "opening" notice and cost accumulation; one for planning purposes; one for record purposes—the number of copies depending upon the size of your maintenance department and the general requirements of your plant.

Just a word of warning here! We have seen many plants with order forms fulfilling these requirements. Maybe yours has, too. But do you carry through in filling it in?

Many times the true intent of this form and its component parts is quite forgotten in the rush of day-to-day work. We frequently find description of the equipment inadequate, thus requiring personal inspection and verification on the part of the responsible maintenance foreman. Such phrases as "make necessary repairs to pump" do not help much when trying to estimate the craftsman's need. Equipment numbers are often omitted, opening up the possibility of mistaken identity on the part of the craftsman assigned. Sometimes there are no labor and material estimates, no dates wanted.

These omissions alone add up to many lost hours and dollars. The time and money you'd save could be used to good effect *any time.*

Time to prevent mistakes is right at the start, with a minimum of effort by the maintenance and operating supervisors concerned.

APPROVAL OF ORDERS

Orders for repair work may be initiated by the operating supervisors, but usually originate in the maintenance department. Approval by the maintenance and operating superintendents is sufficient in this case.

Incidentally, you can gage the effectiveness of your maintenance inspection effort by comparing the number of orders for repairs issued by maintenance with those issued by operating personnel. If more orders are issued by maintenance it's a sign the department is doing a good job of inspection. And remember, if a majority of the orders are prepared by your maintenance people, your operating supervisors have just that much more time to spend on their prime responsibility of keeping up a high rate of production.

Unless you have a separate construction department, your maintenance department probably does many jobs of a nonmaintenance nature—moves, rearrangements, process changes, and so on. Make sure the maintenance department approves these changes from the aspect of standardization, overall plans, and effect on the maintenance budget.

The routing of work requests for approval is a touchy subject in many plants—and sometimes a difficult one. There is often a tendency for the higher echelons, including the engineering department, to hold these requests longer than is actually necessary. The result is that the orders are released so late that a job that could have been easily planned and fitted in conveniently with regular maintenance work becomes a "rush" job. This not only interrupts and delays work in progress, but sometimes calls for unnecessary overtime.

To correct this, the work of the maintenance department must be well organized and planned so that the effect of these interruptions and delays shows up clearly with relation to the overall maintenance program. Secondly, complete and up-to-date instructions must be issued, pinpointing each person's responsibility with respect to approval procedure.

Sure, you can say you're too busy to worry about these comparatively small details. But, by watching them, you can expect the following:

1. A better organization of the work and improved maintenance service.

2. Longer-range maintenance plans, better coordinated with existing production schedules.

② MATERIAL AND LABOR ESTIMATE

MATERIAL REQUIRED

QUANTITY	DESCRIPTION	CODE	UNIT	AMOUNT
2	MAIN BEARINGS			12.00
1	SET GASKETS			4.00
			TOTAL	16.00

LABOR REQUIRED

OPER.	DESCRIPTION	CRAFT	NO. MEN	ELAPSED HOURS	TOTAL HOURS
1	DISCONNECT PUMP	PF	2	2	4
2	REMOVE PUMP TO				
	SHOP + REMOVE SHAFT	MW	2	3	6
3	METALIZE + MACHINE				
	SHAFT BEARING SURFACES	MACH	1	8	8
4	REPLACE MAIN BEARINGS	MW	2	2	4
5	REPLACE + BALANCE SHAFT	MW	2	4	8
6	SET IN POSITION +				
	CONNECT TO LINE	PF	2	4	8
START TIME MON., AUG. 14, 7 AM.		TOTAL HOURS			38

PHASE 2 · PLANNING AND SCHEDULING

Proper work planning will raise maintenance efficiency by providing:

- Adequate preparation, which includes tools, parts, materials, and craftsmen.
- Formal instructions to the workers as to their order of work for the following day or days.
- Proper tie-in between crafts.
- Proper job priority so that equipment downtime is kept at an economic minimum.
- Insurance that all jobs, large and small, are completed once they are started.

We often find this phase of maintenance management the most neglected. As a result, improved planning methods usually bring the largest and most immediate pay-off.

There seems to be a common feeling among maintenance personnel that the work cannot be planned in advance with any assurance that the plan can be executed. The argument is that rush jobs and breakdowns continuously interfere with any attempt at planning ahead, thereby wasting the effort that the planning required in the first place.

This plea always indicates to us (and it should also indicate to you) that your preventive maintenance program is falling down, *allowing too many breakdowns.* Or maybe you're trying to do too detailed a job. Also, planning procedures may have been misguided somewhere along the way and may lack the flexibility that is a prerequisite. Maintenance planning that can anticipate 80% or more of the work a day ahead is good.

Just what are the prerequisites for successful maintenance planning?

1. The planning must be simple and easy to operate, but it must cover *all* of the work of the maintenance forces.

Don't make the mistake some people make of concentrating on the larger jobs, assuming that the smaller repairs will take care of themselves. This is dangerous and probably accounts for the fact that a review of their order files has revealed orders two and three years old. These old neglected orders do not do much to strengthen the important relationships between maintenance and production operations. On the contrary, they cause the operating personnel to lose confidence in the ability of the maintenance department to plan work properly and expeditiously. What happens when this gets too bad? Operating supervisors request that permanently assigned maintenance craftsmen be placed on the operating department payroll. These craftsmen in turn do not get proper supervision, training, or guidance.

2. The work order must provide *complete* instructions. We have already discussed this.

3. Each job must be estimated in advance, giving an analysis of man-hours by craft for each operation and of materials required.

This is probably the toughest requirement and usually the most difficult one to "sell" to maintenance foremen. Many of them feel that it is an out-and-out impossibility. It *is* difficult. But, by thinking out the logical steps of each job in their proper sequence, along with the material requirements, *before the job is started,* the foreman is performing one of his *first* supervisory responsibilities. If he cannot do this, it goes without saying that he cannot properly supervise his men's work.

Estimating goes hand in hand with planning. While thinking the job out, the foreman can just as easily record both the operations and material requirements in the estimate space provided on the back of the planning copy of the work order. (See Figure 2.)

You can then delegate the actual planning and checking of material availability to an assistant foreman or maintenance planner. Thus the foreman is relieved of carrying these details in his head and is left free to concentrate on training, job supervision, and inspection.

Good estimating is the key to maintenance plan-

ning. The listing of these job elements by the foreman takes the information out of his "hat" and forms the basis for preparing day-to-day plans. It also helps to develop better work methods, and provides more accurate information on craft loads.

4. Establish job priority by date wanted, not by "Priority No. 1," "Rush," or "Soon as possible."

Too often orders are started only when a production supervisor howls long enough and loud enough to get action. Many times it is necessary to "borrow" craftsmen temporarily from jobs that are not yet completed in order to take care of so-called "rush jobs." Just because the maintenance department is primarily a service group does not mean you are free to take from jobs *before* they are completed, in favor of jobs which on the surface appear more important. Often an actual investigation of the importance of each of these "rush jobs" reveals that it *can* wait until other work (usually of a short duration) is completed. Then you can assign craftsmen in an orderly manner.

Get both your production and maintenance people in the habit of using the "date wanted" section of the work order. Work on the understanding that you will meet these dates, or will notify people in advance that the dates cannot be met. A few successful applications of this principle will go a long way towards eliminating phoney rush orders and welding better relations.

3 PROJECT PLANNING CHART — AUGUST

DESCRIPTION OF WORK	BLDG.	ORDER NO.	14 MON.	15 TUES.	16 WED.	17
REMOVE, REPAIR, + REPLACE DAMAGED SHAFT, PUMP #350	#29	1905	2 PF; DISC. PUMP; 2 MW; REMOVE SHAFT; 1 MACHINIST METALIZE + MACHINE	2 MW; REPLACE MAIN B'RGS.; 2 MW	2 PF; SET IN POSITION + CONNECT	
REMOVE INSULATION, + REPAIR LEAKS - GEN'L CIRC. LINE	#3	1930	INSULATOR; 1 WELDER; 2 PF	2 PF; INSULTR		

4 DAILY ORDER OF WORK SHEET

TO Ed Pike CRAFT Pipefitters THE FOLLOWING JOBS ARE SCHEDULED FOR WORK ON MON., AUG. 14

WORK ORDER NUMBER	BLDG.	DESCRIPTION OF WORK	MEN REQUIRED	START TIME	STARTED	RUNNING	STOPPED	COMPLETED	ACTUAL MANHOURS	REASON FOR DELAY
1905	#29	Disconnect Pump #350 (NE 2nd floor corner)	2	7AM						
1930	# 3	Disconnect Gen. Circ. Line for repairs	2	9AM						

5 PROJECT PLANNING CHART — AUGUST

DESCRIPTION OF WORK	BLDG.	ORDER NUMBER	MON. 14 (TIME POSTED)	TUES. 15	WED. 16
REMOVE, REPAIR + REPLACE DAMAGED SHAFT PUMP #350	#29	1905	2 PF; 2 MW; 1 HR.; 1 MACHINIST	2 MW; 2 MW	2 PF
REMOVE INSULATION + REPAIR LEAKS - GEN. CIRC. LINE	#3	1930	INSULATOR; 1 WELDER; 2 PF	INSULATOR; 2 PF	

5. Plan work so that a day's work in advance is laid out for each craftsman each day.

On receipt of the work order, estimate each job and establish a "start" date. Then lay out the job elements graphically as taken from the foremen's estimates, on a project planning chart to relate the operations to time. The chart (Figure 3) shows: the work to be done, the length of time it will take, the crafts required.

Work is laid out on this chart for the following day—i.e., planned ahead for all crews. The work is scheduled as rapidly as available manpower allows. Dates wanted are renegotiated on jobs that cannot be started in time.

The next step after this schedule is established is to give the maintenance foreman a daily order of work sheet (Figure 4). It shows what work each crew will undertake the following day, approximate starting time, description, and location.

Each foreman gets his order of work sheet the afternoon before the work is to be done, to allow ample time for drawing parts, tools, and materials from stores before the actual work is to start.

When the job assignments are made and after the work starts, the maintenance superintendent or his "planner" tours the plant twice a day—in mid-day and mid-afternoon. He determines what progress has been made on each job. Heavy lines are drawn on the original schedule to show this progress (see Figure 5).

By referring to the planning charts the maintenance superintendent can:

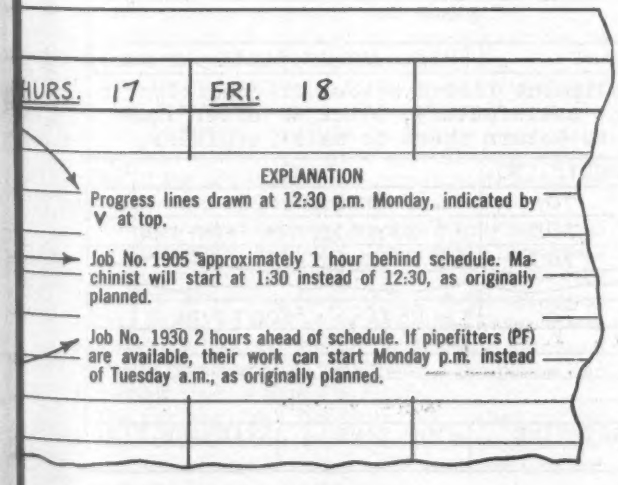
1. Keep informed as to overall progress.

2. Direct his attention to those jobs behind schedule where his help is required.

3. See clearly what effect rush jobs have on those in process, and which jobs can more conveniently be delayed if necessary.

4. Keep operating personnel informed as to job status without requiring special field checks that are time consuming and sometimes inaccurate. See Figure 5.

With this type of planning, you get little jobs done along with the big ones. You reduce interruptions to jobs in progress. The craftsman develops more pride in his workmanship by seeing one job *completed*, and then moving on to the next.


HURS. 17
FRI. 18
EXPLANATION
Progress lines drawn at 12:30 p.m. Monday, indicated by V at top.
Job No. 1905 approximately 1 hour behind schedule. Machinist will start at 1:30 instead of 12:30, as originally planned.
Job No. 1930 2 hours ahead of schedule. If pipefitters (PF) are available, their work can start Monday p.m. instead of Tuesday a.m., as originally planned.

PHASE 3 · PREVENTIVE MAINTENANCE PROBLEMS

You can't adopt cures until you know what requires maintenance. Is there a list of *all* your equipment readily available? Is your equipment numbered? Do you have any standard equipment record cards in use?

Naturally, the answers to such questions vary in different plants, usually in direct proportion to top-level interest in the maintenance activities. In some cases we have asked executives these questions and they could not even answer them. They didn't know.

Such ignorance represents a low level of interest in maintenance. But once conscious of the problem, many of these same managers later became intensely interested in getting these things done—establishing equipment lists, numbering equipment, and setting up equipment record cards. They wanted to know *what required maintenance.*

EQUIPMENT NUMBERS

Start your program by making a physical inventory of your equipment.

This is an excellent job to assign to a trainee engineer or other young up-and-coming member of the maintenance organization. He learns a great deal about the plant and the equipment.

Later you have the list reviewed and approved by the responsible maintenance and plant executives. Numbers are assigned and equipment tagged.

Keep in mind that in the near future you are going to be faced with training some pretty green help. Chances are they'll understand specific equipment numbers much more readily than they will "steam generator," "water pump," and similar generalities.

EQUIPMENT RECORDS

Properly designed equipment record forms are the foundation of your preventive maintenance program. Take a look at your equipment record card. If complete, it contains the information that appears on the sample card shown in Figure 6.

It's important to keep all equipment record cards in a permanent file, preferably by (1) building, then (2) floor, and then (3) equipment number.

Start this file as soon as possible. The sooner you start it, the sooner, you'll have the frequency data you need to schedule inspections and lubrications.

Sometimes you can get considerable information about previous repairs and adjustments from closed-out work orders or from log books. These data for one or two past years should be recorded on the back of the cards. Historical information aids in setting the inspection intervals.

About once every six months, make an engineering review of these data to locate repetitive repairs. From this review you can:

1. Justify the need of equipment redesign.

2. Study for methods improvement in the way of better force organization, tool kits, etc., on repetitive jobs.

3. Recommend replacement of high-cost items.

Annually you can use this same cost information for preparing the maintenance budget. You do this

6 EQUIPMENT RECORD CARD (front)

EQUIP. NO.	EQUIP. NAME	BLDG.	FLOOR
350	ROTARY PUMP	#29	2nd

MANUFACTURER'S NAME	MFG. ORDER NO.	SERIAL NO.	TYPE OR MODEL
J. J. JONES PUMP CO	AX-3356	125689	3600-BL

SIZE	DRAWING NO.	PURCH. ORDER NO.	JOB ORDER NO.	DATE INSTALLED	COST
#4	X-231	125680	—	JAN. 20, 1950	$250.00

DESCRIPTION OF EQUIPMENT

GENERAL PURPOSE PUMP - HEAVY DUTY

3" PIPE SIZE

445 RPM

1.25 MAX. H.P. - 100 gpm @ 0# P.S.I.
3.40 " H.P. - 92 gpm @ 30# P.S.I.
6.20 " H.P. - 82 gpm @ 60# P.S.I.

WT. 130 LBS.

ROUTINE INSPECTIONS		ROUTINE LUBRICATIONS	
BY	INTERVAL	BY	INTERVAL
F. D. MANN	DAILY	J. D. HUNT	WEEKLY

PERIODIC INSPECTIONS		PERIODIC LUBRICATIONS	
BY	INTERVAL	BY	INTERVAL
B. L. CAMP	MONTHLY (from 5/26/50)	J. D. HUNT	MONTHLY

RECORD OF DIMENSION CHANGES

DATE	PART NAME & NUMBER	ORIG.	NEW

SPARE PARTS TO STOCK

MFRS. PART #	PART NAME	QUAN.
D-133	SPLIT TYPE GLAND	2
D-190	SPLIT RING PACKING	6 BX
D-320	BRONZE BEARINGS	4
F-100	STAINLESS STEEL SHAFT	1
D-333	GEARS	4

CARD NO. 1 STARTED JAN. 25, 50

6 (back) HISTORY OF REPAIRS — EQUIP. NO.

DATE	W.O. OR J.O. NO.	DESCRIPTION OF REPAIRS	LABOR COST	MAT'L. COST
2/13/50	1523	REPACKED GLANDS	6 00	4 60
3/1/50	1540	REMOVED + INSTALLED NEW RELIEF VALVE	7 20	12 00
3/20/50	1601	REPLACED GEARS	19 80	25 60
5/15/50	1729	INSTALLED NEW ELECTRICAL CONTROL BOX	6 50	4 80
6/19/50	1752	REMOVED + INSTALLED NEW RELIEF VALVE	8 60	14 00
8/16/50	1905	REMOVED, REPAIRED, + REPLACED DAMAGED SHAFT + REPLACED MAIN BEARINGS	66 50	18 00

7 ROUTINE INSPECTION SHEET

PLANT	INSPECTION	SHIFT	DATE
NO. 1	MILLWRIGHT	NIGHT	2-12

Inspect and make minor adjustments to equipment listed below. If condition is satisfactory, place ✓ after name. If not satisfactory, place X after name and describe condition at bottom of sheet. Return sheet to maint. engineer.

EQUIP. NO.	NAME	✓X	EQUIP. NO.	NAME	✓X
674	WINDER		701	#6 FOURDRINIER	
678	SECOND CALENDER		702	#5 DRYER SECTION-FRONT SIDE	
664	REEL		703	#4 PRESS SECTION- "	
653	FIRST CALENDER		721	#6 DRYERS - FRONT SIDE	

List below any unsatisfactory equipment:

EQUIP. NO.	CONDITION

INSPECTED BY FOREMAN	MAINT. ENG'R.	START TIME	STOP TIME	STANDARD TIME

8 MAINTENANCE TICKLER FILE CARD

EQUIP. NO.	NAME		BLDG.
350	ROTARY PUMP-JONES		29
INTERVAL	OPERATION	BY	FLOOR
MONTHLY(5-26)	INSPECTION	B.L.CAMP	2nd

DATE OPERATION PERFORMED		
2-1-50	8-30-50	
2-16-50	9-27-50	
3-2-50	10-25-50	
3-17-50	11-25-50	
3-30-50		
4-12-50		
4-28-50		
5-12-50		
5-26-50		
6-28-50		
7-26-50		

by determining over the past year (1) major repair costs for each item of equipment, (2) labor and materials required for routine and periodic inspections and lubrications.

This historical information, adjusted for any anticipated changes in production for the coming year, provides an excellent basis for forecasting the maintenance costs.

SCHEDULED INSPECTIONS AND LUBRICATIONS

The front of the equipment record card provides space for entering *routine* inspections and *periodic* inspections. The same for lubrications. We are going to talk about inspections only. The procedures for lubrications follow the same pattern.

We think of *routine* inspections as those performed at weekly intervals, or more often, on a routine basis. The *periodic* type are check inspections, and are performed at intervals greater than weekly.

In each case, the name of the inspector and the inspection interval are recorded.

Routine inspections can normally be accomplished by the "area" or night shift maintenance men. Periodic inspections should be handled by senior maintenance personnel, or craft or area foremen, and on some of the larger and more important items by the mechanical and electrical supervisors.

You may ask, "But how do I instruct my men as to what inspections to make?" For *routine* inspections you can prepare preprinted inspection sheets for each inspector. Make them up directly from the equipment record cards, by area or by building. These sheets act as check lists and furnish the inspector a form on which to report unusual conditions. A sample routine inspection sheet is shown in Figure 7.

The *periodic* check inspections are "called up" by a maintenance tickler file. After the inspection data are compiled and posted on the equipment record cards, the maintenance planner or a clerk can start the tickler file. He usually prepares one card for each piece of equipment. Where more than one person makes inspections at different intervals, extra cards are needed. For a sample tickler card, see Figure 8.

As the clerk makes out each tickler card, he files it in a box that is partitioned by separators, one for each week in the year. Each card is filed under the week in which the inspection is to be made.

Naturally this file must be set up so that there is an equal distribution of work for each inspector. You have to guard against heavy loads in one week and light loads the next.

Here's how to use the file. Late in the current week the inspector pulls out tickler cards for the following week. He sorts them by items and location and lists them on a periodic inspection sheet. This is similar in format to the *routine* inspection sheet, but *not* preprinted because of changing inspection frequencies. The tickler cards stay in their position in the file until "checked out," as will be described.

The inspector checkmarks each inspection on the periodic inspection sheet as it is made. In addition he adds any pertinent remarks, if the condition of the equipment does not appear to be satisfactory.

Upon completion of the inspections you post the inspection dates onto the tickler cards. You then refile the cards ahead under the weekly date in which the next inspection should be made. Since this procedure can often involve much clerical work, it will pay to use the cheaper clerical skills where possible.

Be sure to issue work orders at the same time to cover any necessary repairs. If you don't, your inspections are valueless.

In a similar manner you can lay out lubrications on a route basis. Oil changes can also be called up systematically.

You may say: "This looks like a pile of paperwork!" Sure it's paperwork, but the kind that is aimed at getting work done. It's just another tool designed to help the foreman carry out his management responsibilities.

PHASE 4 · WORK-LOAD MEASUREMENT

How do you know you have enough men for the maintenance load? Recently we took part in a discussion on work load led by the plant manager and the chief engineer of a large plant in Canada. Each was concerned with the volume of work in larger projects that were being released to the maintenance shops, although each had an altogether different approach to the problem.

The discussion boiled down to something like this:

Plant manager: *"Now, Jimmie, 6000 hours isn't such an awful lot of work spread out over* all *our shops, is it?"*

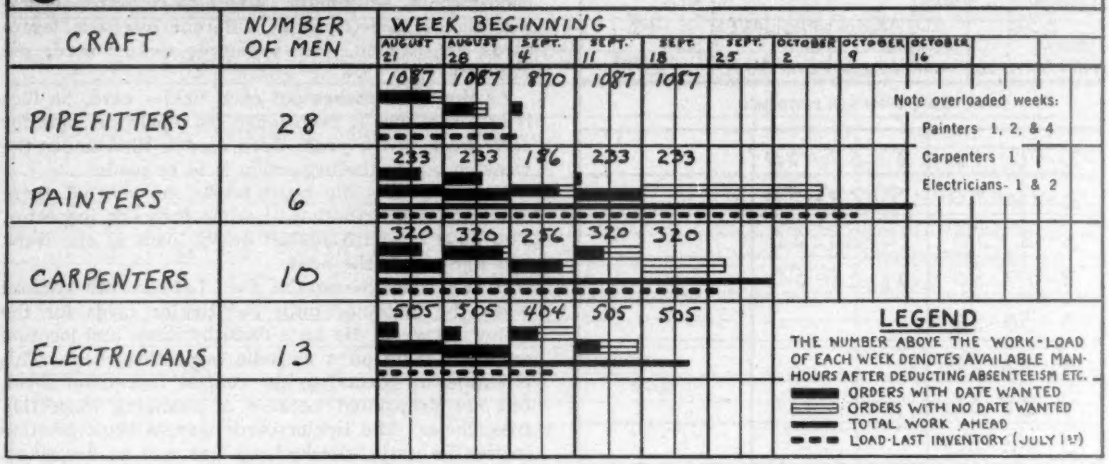
Chief engineer: *"No, granted it may not be, but it's a heck of a long stretch in* one *man's lifetime."*

It is obvious that these men were attacking the work-load problem from opposite ends. The manager thought there was ample manpower for the jobs, the chief engineer didn't think there was enough.

Now don't think that we're singling these two

HOW TO BUILD A MAINTENANCE PROGRAM NOW . . . begins on page 97

9 PLANT SUMMARY WORK-LOAD CHART



men out as unusual, because they're not. Nor is their argument unique in their plant alone. We hear similar stories many times—this one just happened to be the last. That's why we stressed two things when we were talking about planning. These were the need for:

1. Formal estimates in terms of man-hours by craft for each major operation on a work order.
2. Realistic "date wanted" on all orders when they are written.

This information, as applied daily, constitutes the basis for short-range planning—i.e., making preliminary preparations and issuing instructions to craftsmen on an order of work sheet the day before the work is to be undertaken; following the progress of jobs throughout the day, thereby showing the effect that delays and rush jobs have on the overall plan.

So much for the daily planning. You can use the same data—estimates of man-hours by craft and dates wanted—to prepare load charts. What's more, these load charts require *no extra work* from your maintenance personnel. You can issue them periodically to management showing *when* this work is requested to be done and exactly *how much* of the available capacity (man-hours) is required to perform such work. Not until then will the boss know just how much of a work load "that 6000 hours" actually represents.

How is it best to present this information? There are several ways. We recommend that it be done graphically, showing total anticipated, craft man-hours for each craft each week (as in Figure 9). This keeps it simple and easy to understand, yet shows the whole story.

Further, key the chart to show the difference between the various types of maintenance work, such as (1) number of orders with dates wanted, (2) number of orders with no dates wanted, and (3) total work ahead.

It's best not to show the routine maintenance, inspections, and lubrications on the chart. As a rule you can deduct standard time allowances for these services from total man-hours available.

Your summary work-load chart is a wonderful administrative tool for backing up major recommendations to top management, such as:

1. Need for overtime during certain periods; what crafts involved; how many hours.
2. Need for subcontracting to relieve periodic peak loads.
3. Need for increasing maintenance force when certain craft capacities are continuously overloaded.

Other general uses of the chart are:

1. As a general information report to operating supervisors—to be used as a gage for planning larger repair jobs and overhauls in between heavily loaded periods.
2. To enable the maintenance planner to make accurate promises on requests for future work.
3. To show load trends among crafts and for the total maintenance force.

We suggest you issue completed load charts at least monthly to management, along with accompanying comments and recommendations. Where overloads exist you can do several things: (1) renegotiate "date wanted" to future weeks; (2) get approval of overtime; (3) increase number of craftsmen; or (4) subcontract some of the work.

PHASE 5 · MAINTENANCE STORES CONTROL

The prime objective of your stores department is to have on hand materials and spare parts when required, at the same time achieving an economic balance in the dollar investment.

To have on hand materials and spare parts when required, it follows that you must know *what parts to stock*. Also, to achieve an economic balance in dollar investment, you must know *how many* of these parts to keep on hand.

In a long-established plant, the best way to determine what to stock and what levels to hold is to review and analyze past stores records. If you don't have maintenance stores records, try to review purchase orders. Summarize them by item so that some estimate of past usage can be determined. In a new

plant you have to use manufacturer's recommendations tempered by good judgment.

But that isn't all. By referring to the equipment record cards, you can then add whatever spare parts have already been specified by maintenance personnel when setting up those cards. How many to stock will be regulated by the number of machines using the same parts, and actual or estimated usage. More later on this important function.

STORES ANALYSIS

If you have not normally made a stores analysis each year, now is as good a time as any to do it. Those of you who have already gone through the steps will vouch for the dividends that can be expected. You will uncover slow-moving and obsolete items. You then recalculate order points and economic order quantities for the former. And you get rid of the latter by either selling or scrapping.

In a stores analysis made some time ago we found enough of one part in stock, based on current usage, to last the company for 21 years!

To start this analysis, first divide your maintenance stock into three main classes:

Class A. Articles to be kept in stock regularly.

Class B. Articles to be used up and not reordered.

Class C. Articles to be sold or scrapped right away.

Stock can best be classified by examining the history of issues for guidance. Issues within the past 12 months will probably indicate that the item should be in Class A. If there have been no issues during this period and the item is *not* a spare part for a piece of equipment, the item should be placed in either Class B or C.

Class A items can be subdivided as follows:

1. Fast-moving items: hardware, pipefittings, lubricants, and others.

2. Slow-moving, relatively inexpensive spares: roller bearings, small valves, and the like.

3. Larger, relatively expensive spare parts, that normally outlast the time required for replacement: pump impellers, motors of 100 hp. and larger, conveyor belts.

For each of these categories it is necessary to use different methods for calculating the order points and order quantities. The following rules will prove helpful:

Fast-moving items • Base the *order point* on past usage. Specifically, the average number of pieces used per week, multiplied by the replacement time in weeks, equals the order point.

Determine the *order quantity* either by formula for economic lot size (found in any standard production handbook), or by best combination of quantity and price purchased. You may have to adjust either of these methods according to turnover practices established by company policy. The quantities may further be governed by amount of storage space available.

Maybe you think these mathematical methods will keep your stocks too low in times of material shortages. You've got to take that calculated risk. Don't get in the habit of the head storeskeeper who boosted the order quantity to allow a small factor of safety, and forwarded the order to the maintenance superintendent for approval. The maintenance superintendent boosted the same order for the same reason. Finally, the purchasing agent boosted it some more!

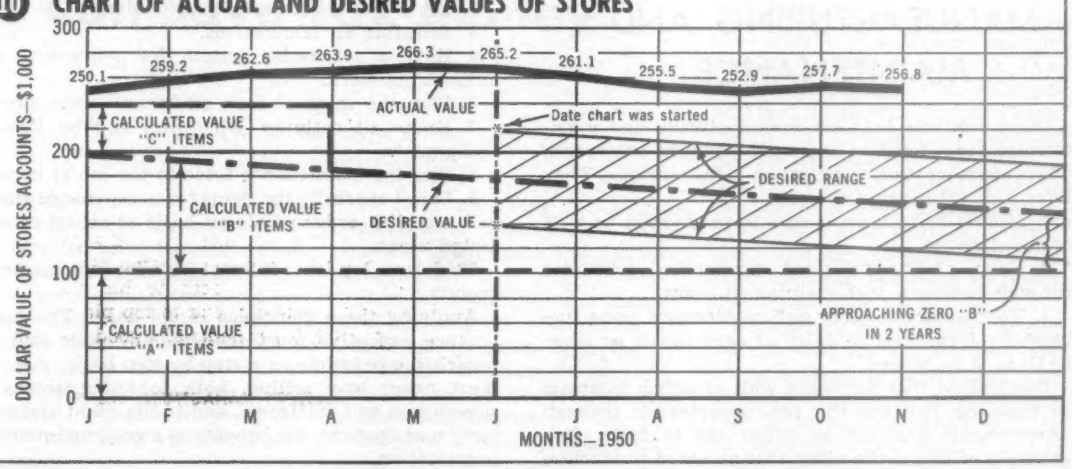
They were all unconsciously allowing for an increased procurement time. Not one of them thought of doing it the right way—recalculating the order point based on that increased procurement-time. This would have tied up lots less capital.

Slow-moving relatively inexpensive items • Calculate as above if unit value is less than $50 and if the calculated order points based on usage and procurement time are more than *one*.

If value is less than $50 and the calculated order point is less than one, establish both the order point and order quantity at unity, so that at least one of these parts will either be on hand or on order at all times. If this protection is not necessary, set the item up as a "zero-and-check" item, explained below.

Larger, relatively expensive spares • Because of their value, you can't keep all these items on hand if you want to maintain economic inventory levels. In this class (we call them "zero-and-check" items) when the stock level reaches *zero* the storeskeeper

10 CHART OF ACTUAL AND DESIRED VALUES OF STORES



notifies the maintenance superintendent. The superintendent may reorder immediately, or, depending on the particular item, may delay reordering to some later date when he is again to be notified by the storeskeeper.

After this review and analysis of your maintenance stores, the next step is to establish a "desired minimum value" for maintenance stores.

You calculate desired minimum value for each account, either from worksheets used in making your stores analysis, or if the unit prices and class (A, B, or C) is shown on the stores card, directly from your balance of stores cards.

Knowing this desired minimum value you then use it as a guide to point out when stores inventories are becoming excessive.

We like to present this guide graphically as an executive report, showing the actual balance in stores accounts each month plotted against the calculated or desired minimum value. For a sample chart of actual and desired values of stores, see Figure 10 on page 107.

This report is designed to show top management how well stores are being controlled, within the established order quantities.

So far we have dealt only with the items to be stored. You must also watch such things as facilities and services to the craftsmen. By these we mean consideration of general stores layout, central location, delivery services, and so on, to reduce traveling and waiting time and to speed up withdrawals. In most plants, however, we find these functions in comparatively good shape. There are others that are not. To mention a few fundamental needs:

- Develop storesroom bin location codes and mark the locations conspicuously.
- Use bin location cards and files.
- Mark and separate physically your order-point quantities.
- Locate the fast-moving items close to the issue window.
- Provide handling equipment in accordance with the type, size, weight, and bulkiness, of the stock to be handled.
- Arrange racks to make the best use of daylight, or provide ample artificial light.

PHASE 6 · RELATIONS—MANUFACTURING AND MAINTENANCE

Good relations between manufacturing and maintenance are a must in any well-managed enterprise. Their effect on your organization is far reaching. They have a direct bearing on:

1. Morale in both departments, production as well as maintenance.

2. Your ability to meet production schedules through having a well-maintained plant.

3. Your ability to carry out maintenance plans successfully from start to finish of each repair or overhaul, as it is needed.

Don't allow that menacing wall of selfish interests to build up between the two departments through unreasonable demands of either one or both. One example of this is the plant that accepted production orders "temporarily" far in excess of its ability to produce. It worked for a while, and production looked real good until the "temporary" increase got to be a habit. In a short time the machines were literally "run into the ground." They required increasing amounts of maintenance overtime that might otherwise not have been necessary. This type of operation also affected the attitude of craftsmen in the conduct of their work. After all, they knew they weren't maintaining the plant. They were holding it together with baling wire! Craftsmanship went out the window. If top management had listened to the maintenance head—and usually he's worth listening to—this never would have happened.

The place of the maintenance head in the plant organization has a great deal to do with relations. Many times the plant engineer or maintenance superintendent is shoved off in some remote corner of the organization chart—and plant.

As a result, his recommendations rarely carry enough weight to allow him to carry his proper share of the management responsibilities. Good, sound, economical ideas and plans often go unnoticed and may *never* come to light under this arrangement. His dissatisfaction is often relayed down his chain of command, resulting in an unhappy maintenance department which certainly produces at lower than its efficient rate.

Sometimes, on the other hand, the plant engineer may be overloaded engineering-wise—too many new development jobs to handle. This, too, is at the expense of his maintenance effort.

* * *

TO SUM UP: Each plant presents different problems in all these areas. On account of diversity of product, layout, existing organization, company policies, and even personalities, you have to study your own plant and evaluate its needs in the light of its conditions. There is no *standard* answer to be found in any one plant. There are, however, fundamentals that can and must be observed. We have briefed you on them. You must implement them with the management tools we have suggested.

Regardless of the size of your plant, you've got to take these ten steps:

1. Provide an adequate and clearly defined organization to conduct all phases of maintenance work.
2. Know what requires maintenance.
3. Know the condition of that equipment.
4. Schedule all lubrications.
5. Have a job order system for requesting and authorizing work.
6. Plan the work of each craftsman—each day.
7. Know all costs by job order, and by item of equipment.
8. Size the maintenance force to the job at hand.
9. Select carefully the items for maintenance stores, and establish order points on basis of actual or estimated usage.
10. Insure top-level interest by adequate executive reports.

Applying these principles is not easy. The maintenance executive must take the initiative and approach the program on a *step-by-step* basis. Also, he must never stop selling, both to his maintenance supervisors and craftsmen, and to top plant and company management, the benefits of a good maintenance organization.

WHAT PLANT REPAIRS ARE TAX DEDUCTIBLE

YOU MAY DEDUCT

Replacements
- Short-lived parts of machine, to keep it in efficient working condition
- Safety device for machine for your employee's safety
- Main drive belt for machine
- Rotor bar windings for electric motor
- Timbers to support sidewalk over your basement
- Copper sheeting for cornice of building blown off by wind
- Calking seams, riveting, and installing new tubes, steam gages and safety relief valves on boilers of heating equipment
- Underground cable damaged by flood
- Underpinning of building damaged by water
- Roof supports for warehouse, out of alignment because of sinking subsoil
- Surface of damaged floor

Painting and whitewashing of walls and ceilings

Mending plaster of walls and ceilings

Papering walls

Patching a leaking roof

Mending and stopping leaks in walls and roof, even though, as in one case, the total cost amounts to 35% of the value of the building

Fixing wharf damaged because of excessive use during war period

Relocating steam pipes and radiators

Shoring up building foundation to prevent collapse

Bracing and strengthening wall because of erection of building on adjoining premises

Cutting and filling cracks in storage tanks

Temporary alterations for efficient operation during new construction

YOU MAY NOT DEDUCT

Replacements
- New doors for factory building
- New iron grilles on windows
- New plate-glass windows
- New overhead doors; electric motor; turbine pump; and condensate tank for boiler and heating equipment
- New fire escapes; roof; skylight; walls; concrete cellar; floors; elevator safety device; electric wiring system
- Oil-burning heating system for coal-burner
- Brass piping for iron piping in hot water system
- Steel window for wall
- Concrete wall for wooden one
- New liging of blast furnace
- Automatic attachment of machine for hand device
- New flooring laid over old

Waterproofing basement damaged by leakage

Waterproofing storage tanks

Strengthening wall by bricking up windows

Remodeling and plastering of walls and ceilings

Bricking up windows and cutting new windows to allow more light

Lowering factory floor to adjust level

Raising floor and rearranging shelves and bins as protection against floods

Installing ventilating system

Installing air-cooling system

Moving a department to another location for more efficient operation

Altering building to conform to change in street grading

How the Plant Engineer Can Save Tax Money

By J. K. LASSER, Senior Partner
J. K. Lasser Company, New York

TAXES ARE NOT the unique problem of the accounting department. It only records what happens in all departments of the business.

To a great extent, the plant engineer in his operations fixes tax status. He does this for the money spent in upkeep and improvement of the plant and all equipment. He does it also on money received for sales or trade-ins of machinery and equipment.

So it is necessary for him to work closely with both the accounting department and financial management.

This teamwork — each department knowing the contributory effect of its operation upon the entire profit structure of the company—makes for tax economy in a business organization.

But first let's get straight on a couple of fundamentals:

I'm not trying to teach you accountancy or taxes. I'm not going to talk figures or law—except by way of illustration.

I'd like to show you how different tax results can flow from the same operation or transaction—depending on how you do it. One method of procedure on your job will turn up on your company's tax return as a deduction. Another method will not.

All I hope to do in this article is to indicate the tax implications in your day-to-day activities. Being alert, you can discuss them with your company tax man. He'll dot the i's and cross the t's.

Remember, in an excess profits tax era—such as we have now—$1 of deductions is worth $4.35 in earnings. Or, put it another way, your company must earn $435 to be left with $100 after taxes.

Now, let's get specific.

More on next page

DEDUCTIBLE OR NOT?

One fairly well-known tax principle is that a repair cost is fully deductible on a tax return. The reason? Repairs keep a business property in an efficient operating condition, and so they are ordinary and necessary in production. But when the "repair" adds materially to the value of the property or prolongs its life appreciably, it ceases to be a repair and becomes an improvement or a "replacement."

The cost of an improvement, like an original purchase of a fixed asset, is not deductible. The tax law requires a replacement cost to be capitalized—or changed to a depreciation reserve. That means the replacement cost is not deductible in one lump sum in the year it is incurred. It must be spread (depreciated) over the reasonable expected life of the replacement.

The rule is simple. Repairs are deductible. Replacements are capitalized. But it's easier to state the rule than to apply it. To decide what is a repair and what is a replacement raises a question of intent. What was the purpose in doing work? That's where the plant engineer's memoranda and records become vital to prove an intent to repair rather than to improve or replace.

Often an overall factory project is undertaken that involves several tax concepts — repairs, replacements, as well as improvements. The U. S. Treasury reaction is to lump the whole cost of this kind of undertaking as an improvement and require it to be capitalized. To combat such a stand, the company must have adequate proof to break down the total cost and allocate an amount for deductible repairs.

I have often had the extreme pleasure of confronting a revenue agent with a host of information retained by the plant engineer to support a deduction for repairs. I know one tax-conscious plant engineer who insists always on two contracts—one for the repair items and one for the replacements. As a result, no question is raised about his company's repair deductions.

Because the plant engineer's files can be full of helpful proof for a repair deduction, you should routinely retain necessary information. Include a full record of transactions, contracts, memoranda, notes of conferences, and like information. Do not hesitate to dictate personal contemporary thoughts bearing on the issue and insert them in the file.

Always remember that the revenue agent is impartial and interested in getting the facts. He is impressed with your notations made at the time of the job. He does not hold it against you that you know the tax law and consciously chart your course to get a favorable result. Our tax law is studded with alternative ways to arrive at an objective. One election may carry a high tax—the other a low rate, or no tax at all. The taxpayer is offered the choice. His selection of a method that produces a low tax is neither immoral nor reprehensible —and is approved. A wrong choice resulting in a high tax is solely the fault of the taxpayer.

The plant engineer should know the criteria that are applied to find whether a cost is deductible or must be capitalized. In many cases he can shape his activities to give the most satisfactory tax result. And he'll keep in his files and in his records the information that will prove his objective. Here is a checklist highlighting points considered important in court cases:

The purpose of the repair is important. For example, if the purpose is to continue ordinary operation or use, the cost is deductible as an expense. If the purpose is general improvement or prolonged life, the cost is not deductible.

Replacements can be deductible repairs. The cost of restoring property to its normal expectancy—replacements of like kind to retard deterioration—is deductible. But when something new is added along with the replacement, the new item may have to be capitalized. For example, where waterproofing accompanies the repair of leaks, the waterproofing should be capitalized. Replacements that are part of a general plan or improvement, rehabilitation, or enlargement may not be deductible. If the replacement is a long-lived asset, its cost may have to be capitalized.

The cost of the repair usually does not matter—if other facts prove it is a repair. I know a case where a company acquired a building and 16 months later found that repairs were necessary, because of leaky walls and roof. The repairs cost 35% of the value of the building. The court approved the deduction—despite the extensive work — on the proof that:

(1) There was merely substitution of new parts for the old members;
(2) The material added was a relatively minor portion of the entire structure; and
(3) The life of the entire structure was not appreciably extended over the life reasonably estimated at the date it was built.

The effect of the repair may also be considered. A current deduction is not allowed if the effect of the repair is to make the property more valuable, give it additional functions, or make it more efficient for the function it was already performing. For example, a concrete wall for a wooden one, an asbestos roof for a tin one, an automatic attachment to a loom—have all been held to be not deductible.

Where repairs must be made as an alternative to going out of business or violating a law or requirement of a regulatory body, they are usually deductible. For example, a federal meat inspector's order to oilproof a cellar or close up; a state mine law order for a new airshaft. But, where additional long-lived improvements result from the action, the deduction may not be allowed and the cost may have to be capitalized. For example, a Chicago requirement for better ventilation had to be capitalized as it added to the value of the property.

To be deductible, repairs must be ordinary and necessary. An expense may be ordinary even though it is nonrecurring to the particular taxpayer. It is ordinary if the type of expense is the ordinary way in the industry to meet the particular problem for which the expense was incurred. For example, an expense to prevent an oil encroachment was "ordinary" even though a similar event had never occurred in this taxpayer's history.

Expenses for technological improvements should be capitalized. Even if it is cheaper to re-

place an old machine with a new and better one than to repair the old one, the cost of the new machine may only be recovered through depreciation. That is, the cost can't be deducted as a current expense.

The facts govern the deductibility of an expense for repair or replacement. It makes no difference that you call something a repair when it is really an improvement or *vice versa*. It's what it really is.

Maintenance expenses are fully deductible. It pays to spend money on good plant maintenance. The ordinary expenses incurred in maintaining plant equipment in full operating condition are deductible. This is a "tax bonus" to keep equipment and buildings in a good state of repair. But a replacement of a machine does not give an immediate tax saving. That must be capitalized. In addition, our present economy further hinders efficient production when maintenance is defective. The machine may have to be replaced. Its cost is a capital expense and not deductible. Further, the original machine undoubtedly cost less than its replacement. And, finally, there is the additional difficulty of securing a machine in time of shortage.

For specific examples of deductible and nondeductible repair expenses, see table on page 109.

One word of caution: Don't overreach yourself. The revenue agent is smart. Just as he is fair to you, he wants you to be fair with him. He can easily spot off-the-reservation maneuvering of an amateur. And if he is led to suspect finagling, can you blame him if he digs further?

Big allowances aren't always favorable — they may boomerang. For example, a company that continuously deducted large "repair" items during 1946-1949 (and had them allowed) faces an excess profits tax era with a lowered earnings credit. The dollars saved then were in 38-cent dollars. They are now repayable in 77-cent dollars.

HOW TO SAVE TAX MONEY IN GAINS AND LOSSES FROM SALES OF PROPERTY

Sales by a corporation of "capital assets" held for more than six months get a reduced-rate tax treatment. Net profits from these sales pay a flat 25% tax. (Losses are deductible only as against profits from these sales.) Capital assets, generally, are stocks, bonds, and property not used in the business.

But, for the sale of land and depreciable property used in a business, a different rule is applicable. Gains are taxed at a maximum rate of 25%. Losses are deductible at 100%—no limitation on amount.

When land, buildings, and depreciable property used in a trade or business and held more than six months are sold and the total gains are greater than the total losses, then the net gain is a capital gain. These gains carry a maximum tax burden at 25%. If losses are greater, the net loss is an ordinary loss. These losses are 100% deductible.

What do these rules mean to the plant engineer? Make sure you pick the proper year when you want to replace equipment. Don't indiscriminately dispose of equipment. Why? Because before you find your *net* gain or your *net* loss, you add up your gains and losses at 100%. Losses which are deductible at 100% offset gains which are only taxed at 25%.

I know a company which, when considering replacements, segregates into three groups:

1. Equipment that will bring in more on trade-in than on sale;
2. Equipment that can be sold at a gain; and
3. Equipment that will be sold at a loss.

Then this tax-conscious company effects its profitable sales (2) in one year and its losses (3) in a following year. This procedure secures maximum tax advantage—gains are taxed at 25%, losses are deductible at 100%. A nondiscriminating company having gains and losses in an identical year sacrifices this tax advantage. This is because the gains and losses are taken into account on the tax return at 100% and thus offset each other. Only the *net* capital gain gets the advantage of the 25% rate. The overall effect is to convert capital gain into ordinary income.

Proper handling of your "trade-ins" offers tax-saving opportunities. There is usually no tax to pay on gains resulting from trade-ins. The cost basis (on which you figure depreciation) of the new machinery, equipment, etc., is the same as that for the equipment traded-in plus any cash you paid.

For example, let's assume that your fully depreciated machine has a trade-in value of $100, against a purchase price of $200 for new equipment. If you trade it in, and in addition pay $100 for a new machine, its depreciation basis is $100. But if you sell the old machine for $100 in cash and then pay $200 for a new one, your depreciation basis is $200. You get $100 extra depreciation—deductible at 100%—over the life of the machine. Your tax cost is no greater than 25% of the $100. That is what you owe as a capital gains tax on the sale of the old machine with a zero tax cost for $100.

By selling and repurchasing, you get an extra $100 depreciation deduction—your new cost is $200. That offsets $100 of income that would be taxed at, say, 77%. Against that you have a tax cost of 25% on the $100 of profit from the sale. Your net gain is the difference of 52% on the extra $100.

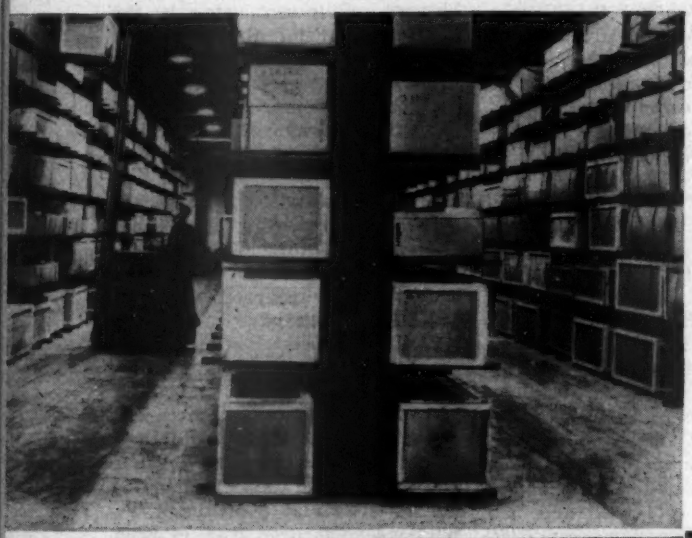
The usual tax-saving rules for trade-ins are these: If you would realize a gain by selling the old machines, equipment, etc., trade them in. You have no taxed gain on the trade-in.

If you would realize a loss by selling, sell first. You then get a fully deductible tax loss. Then use the proceeds from the sale plus any additional amount required and buy the new machines or other equipment. Your basis for depreciation is the entire purchase price.

The new excess profits tax law favors sales over trade-ins, even when there is a gain. A gain is exempt from the excess profits tax and is taxed at capital gains rates. Buying the replacement property rather than obtaining it from a trade-in will produce higher annual depreciation. And that is fully deductible against both income and excess profits taxes.

A final word—don't try to be a tax expert. Be tax-conscious. No one expects you to resolve tax problems. But management is sincerely grateful for your awareness of the alternatives available in your field for reducing your company's tax bill.

OPERATING SHORTS



Cantilever Rack Eliminates Pallets, Cuts Handling

Cantilever racks keep every box of goods in storage directly accessible at Bradford Dyeing Association, Westerly, R. I. Racks consist of H-frame sections 14½ feet high, with adjustable arms 30 inches long. Each rack has 14 pairs of arms; each pair supports 1000 pounds. The fork truck places boxes directly on the arms; no pallets are needed. When any box is needed for shipping, it can be removed from the rack without handling any other box. Arms can be adjusted up or down by loosening a single bolt.

Source: Unistrut Products Company, Chicago

On-the-Floor Roller Conveyor Loads Elevators

Sections of roller conveyor on the floor by the elevator shafts and inside the elevators simplify materials handling at the Philadelphia Refinery of Gulf Oil Corporation. A fork truck leaves pallet loads of materials—enough to fill the elevator—on the roller conveyor in front of the shaft. Then the fork truck goes on about its business and the elevator operator easily pushes the load onto matching roller sections in the elevator by hand. At destination the operation is reversed. The roller sections save the time of both elevator and fork truck operators, make it possible to load elevators to capacity.

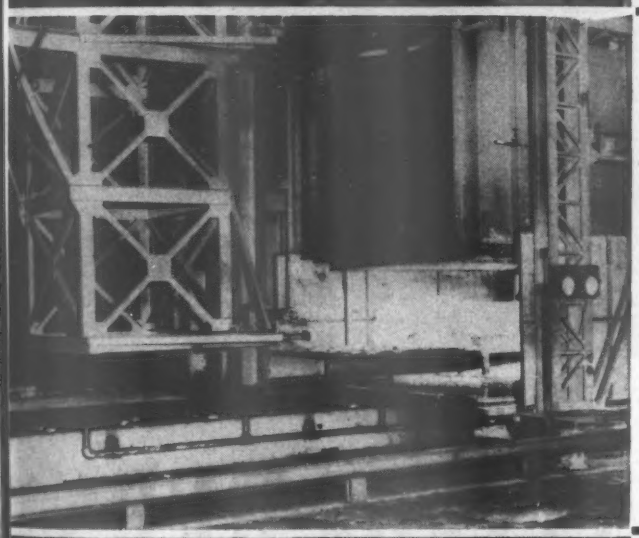
With These Tongs One Craneman Handles 30,000 Lbs.

These "ice tongs" handle 30,000-lb. loads of steel rounds, from 4 to 13 inches in diameter, at National Tube Company, Lorain, Ohio. The tongs contain an automatic locking device, so the craneman does the job alone. It's safer that way. With no hookup man there's no chance for misunderstood signals, premature lifts.

Source: Heppenstall Company, Pittsburgh

Display Your Literature in a Handy Rack

Straight from the bus depot comes this display rack for employee literature at the Maytag Company, Newton, Iowa. It's built out of ¼-in. plywood, holds up to 12 copies of each brochure, with room for two brochures in each pocket. The rack hangs on a post, takes up almost no room. Another version of the rack lies flat against the wall. These racks collect all company literature in one place, make it easy for every employee to find just the information he wants.



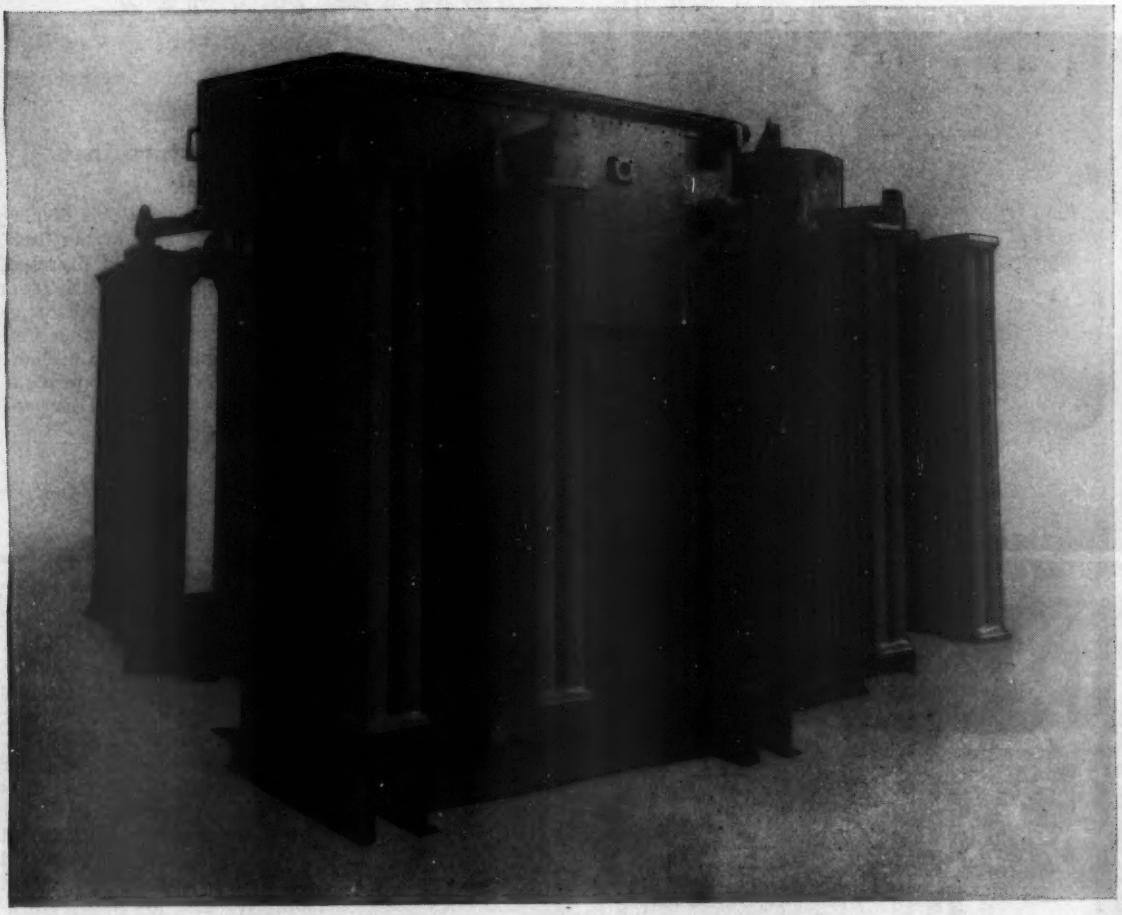
Electric Furnaces Cut Costs, Ease Work Load

Electric furnaces recently installed at National Malleable & Steel Casting Company, Cleveland, are making savings seven ways:

(1) Shorter production time cycle; (2) easier loading and unloading (gantry-type crane lifts furnace off base, shoves load underneath); (3) better quality product because of better heat control; (4) saving in floor space; (5) reduced maintenance (by 40%); (6) reduction in high cost of annealing containers; and (7) better working conditions. The company is using three high-temperature annealing furnaces, two low-temperature drawing furnaces, each of 5-ton capacity. *Source: General Electric Company.*

A Gang Air Hose Connector for Assembly Jobs

A homemade air line extension with multiple outlets serves workers in the assembly area at Twin Coach Company, Buffalo. The connector is a piece of 2-in. pipe about 2½ feet long, with a snap coupling on one end for connection to the lead air line. Two short pieces of angle iron welded to the pipe form a base. Along the top are short ½-in. pipe connections, elbows, and snap couplings for air hoses. Five workers can use the facility.



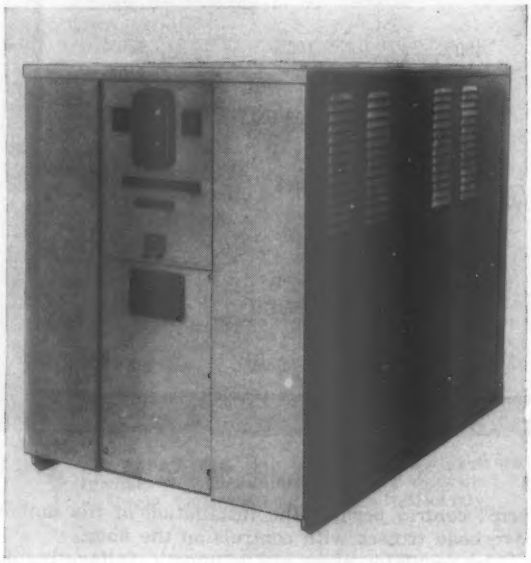
TODAY'S TRANSFORMERS AND ACCESSORIES

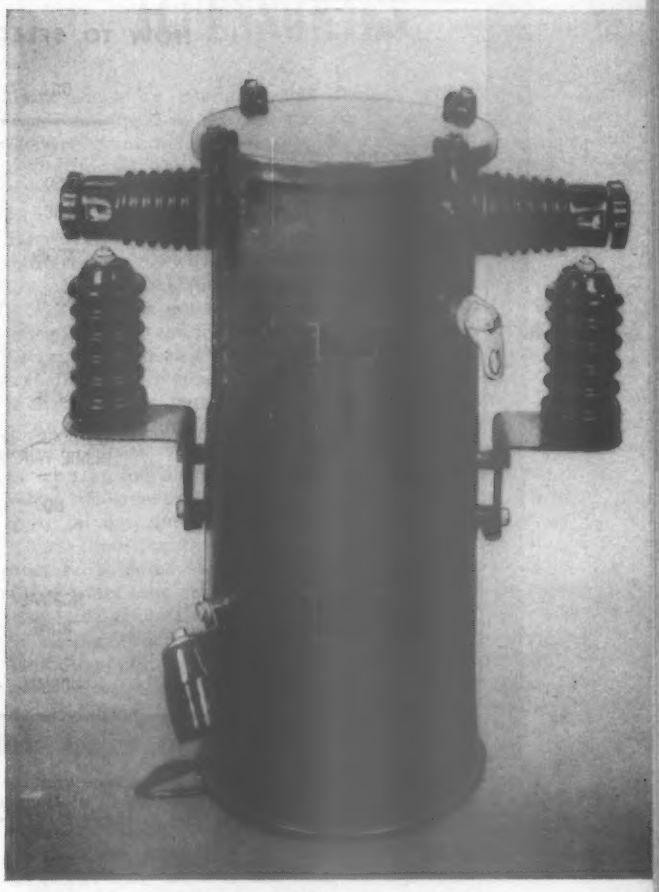
Transformers are doing the same job today that they did years ago. But they're doing that job better. Improved designs, better materials, standardized parts bring you more transformer performance for your dollar than ever before.

By J. W. ST. ANDRE • Electrical Editor • FACTORY

A POWER TRANSFORMER for today's plant needs. It's a 3750 kva., 3-phase, 60 cycle, 13,200 volt primary, 2400 volt secondary unit.

POWER PACKS for a.c. light and power service have built-in voltage regulators. Power operated controls permit remote operation.





OUTDOOR POWER TRANSFORMER has both overload and lightning protection built in. A signal light shows maximum loading band.

YOU GET MORE FOR YOUR MONEY TODAY when you buy transformers than you did a few years back. Better design, new materials, and standardization of parts have brought this result: You get relatively more transformer performance per dollar of cost.

There have been many improvements in details of power transformer construction. Air-cooling systems are better. Air-cooled transformers are quieter. Vibration has been cut by slower fans and better mountings. Synthetic-covered wires, which do not absorb water or oil, have replaced rubber in control wiring.

A power transformer is a sizable investment, and is vital to service continuity. Devices that protect them against every hazard are valuable insurance to the plant operating man.

Management, under pressure to hold new power transformer purchases to a minimum, can take advantage of many important improvements that will make old equipment more reliable.

POWER TRANSFORMERS

You can now get hermetically sealed, dry-type transformers with Class B insulation. Extensive tests show that Class B materials in a nitrogen atmosphere can be operated satisfactorily at temperatures up to 180 degrees C.—previously assigned to Class H materials.

The transformers can be installed indoors or outdoors, where there is no danger of lightning. They can be installed underground, where moisture, dust, lint, corrosive fumes, etc., have previously required liquid-filled units or dry-type units that need lots of maintenance. The absence of tubes and radiators simplifies installation, facilitates tank painting, and eliminates liquid testing and maintenance.

You can get small oil-filled transformers for out-

More on next page

HOW TO SELECT TRANSFORMERS

	OIL	ASKERAL	OPEN VENTILATED DRY TYPE	SEALED DRY TYPE
TEMPERATURE RATINGS				
AVERAGE RISE	55C	55C	80C	120C
HOTTEST SPOT	65C	65C	110C	140C
AUDIO SOUND LEVEL	"X" db	"X" db	("X"-10) db	("X" 10) db
WEIGHTS	100%	125%	80%	120%
DIMENSIONS				
FLOOR SPACE	100%	100%	100%	120%
HEIGHTS	100%	100%	90%	110%
APPLICATION	OUTDOORS, or INSIDE VAULTS	ALL	INDOOR ONLY	ALL
FIRE AND EXPLOSION RESISTANT	NO	YES	YES	EXPLOSION PROOF
MAINTENANCE				
LIQUID	NORMAL	INFREQUENT	NONE	NONE
INTERNAL CLEANING	NONE	NONE	FREQUENT	NONE
EXTERNAL CLEANING AND PAINTING	NORMAL	NORMAL	SUB-NORMAL	MINIMUM

GENERAL FACTORS that will affect your selection of transformers. Here, oil-filled type is used as the base. Specific ratings must be checked.

door distribution systems with built-in protection devices against lightning, surges, short circuits, and harmful overloads. They have lightning arrestors and a built-in secondary circuit breaker using current and oil temperature for actuation. Internal high voltage fuse links function, if neccessary, to isolate the transformer.

A signal light, supplied on units of 5 kva. and above, shows red when the transformer enters the maximum safe operating band. It simplifies visual inspection of transformer loading, cutting out expensive load surveys.

One manufacturer has an emergency control handle that allows immediate restoration of service in emergency situations. The lever is sealed to prevent unauthorized use. If the meter seal is broken, the handle can be placed in the emergency position, resetting the circuit breaker to carry greater overloads for a longer period of time.

Where voltage fluctuations are a problem, you can get package-regulating, air-cooled transformers with built-in regulators. The package also includes an incoming-line air circuit breaker. It is electrically operated with time overcurrent protection and instantaneous short-circuit trip. A pushbutton "close-trip" control permits the installation of the unit in overhead trusses with controls on the floor.

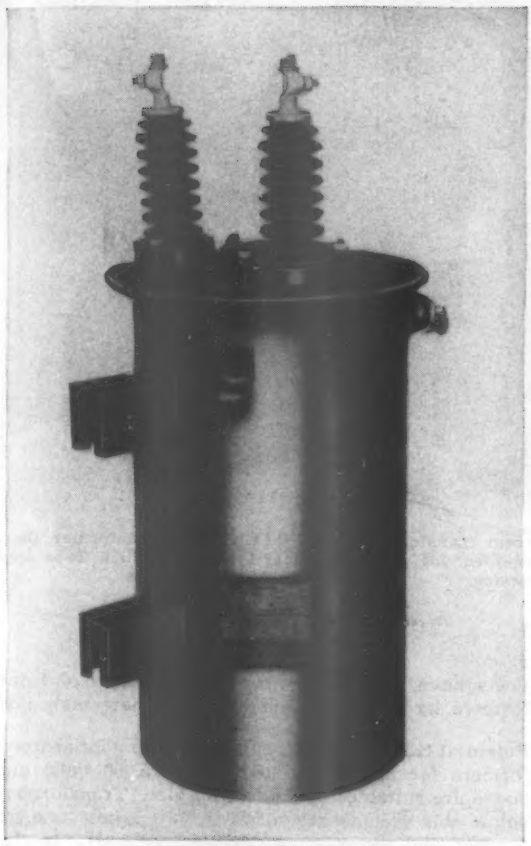
The regulator gives you automatic voltage regulation of plus or minus 10%. Voltage 10% below rating means a drop of 30% in the output of your lamps. Voltage 10% above rating cuts the life of your lamps one third.

By using this package, power for lighting or other 120-volt equipment can be brought to the load center on the 480-volt distribution system.

The use of small air-cooled transformers scattered throughout the plant eliminates the need for heavy copper for branch lighting circuits.

A three-phase explosion-proof electric power center designed for mines, may be used in underground, outdoor, and indoor explosive atmospheres. Core and coils are hermetically sealed in a substantial case filled with dry nitrogen. It provides complete protection from explosion, dirt, falling objects, corrosive fumes, or moisture. Low-voltage feeders are protected by explosion-proof circuit breakers that are manually controlled by a handle on the outside of the enclosure.

A new line of silicone-glass-insulated dry-type transformers are filled with dry nitrogen, sealed in place. Cases are constructed of copper-bearing steel to resist corrosion. A special undercoating gives extra protection. The transformers are sealed hermetically by welding and operate even when flooded. They are available in ratings up to 1000 kva., 13,200/208/120



NO BREATHING can take place in this transformer. "V" ring cover clamp is tightened by a single bolt, yet compresses uniformly.

volts—complete with air-insulated high-voltage disconnecting switches and provisions for mounting a network protector for secondary distribution if needed.

The table opposite shows the comparison of various types of transformers. (In comparing weights and dimensions, percentages are figured on oil-filled type as base.) In general, oil-filled units are the cheapest, followed by askarel insulated, and open ventilated dry-type. The new sealed dry-type units run higher.

One of the major causes of failure of the insulating oil in oil-filled transformers is "breathing." Changes in temperature draw moisture or dust into the tank through the joint between tank and cover.

One manufacturer has solved this problem by using a rubber gasket, resistant to oil, age, sunlight, or temperature change. No adhesive is needed. The gasket can be reused.

To provide true sealed-tank construction for its line of distribution transformers, one manufacturer has developed an entirely new method of fastening the cover to the tank. The cover clamp consists of a ring of V-shaped cross section which fits over the edge of the cover and the lip of the tank. The ring is tightened by a single bolt; the pressure exerted on the cover gasket is equal at all points. No breathing can take place.

TRANSFORMER ACCESSORIES

Many accessory products and devices which have been introduced in the last two or three years have been of great benefit to transformer users.

Addition of inhibitors increases oxidation resistance of the oil used in oil-cooled transformers. They retard formation of acids, sludge, etc., which cause deterioration of the insulating oil. Additions of these inhibitors in no way affect the electrical characteristics of the oil. Life of the oil is more than trebled.

You can now get transformers equipped with thermosiphon oil conditioners which have no moving parts. They absorb moisture, acid, and sludge from transformer oil continuously while the transformer is in operation. Such a conditioner can be mounted on an old transformer, too. The unit maintains properties of regular transformer oil or askeral-type oil for as long as the absorbent material remains effective. When, after several years, the annual inspection tests show oil deterioration, you replace the conditioner.

The conditioning agent is held in an all-welded steel tank, dome shaped at both ends. The tank is about 4 feet long and 12 inches in diameter. It weighs about 167 pounds, without oil.

The conditioning agent is in ¼- to ½-in. granules, providing abundant surface contact and assuring ready passage of the oil. Hot oil will flow in at the top and filter through the activated materials. The oil is cooled in the container and then flows back into the bottom of the transformer.

A new relay that makes automatic the safe loading of power transformers to their full thermal limit is dependent upon: (1) the temperature of the top oil, (2) the load carried by the transformer, and (3) the length of time the load has been carried. The device operates three snap-action self-resetting switches.

The first switch operates with increase of transformer load to start the cooling fans. If the load increases and approaches the safe thermal operating limits, the second switch closes to give a warning. If load continues to increase until the thermal limit is reached, the third switch closes—either tripping the breaker or giving an audible alarm.

A similar relay can now be used with air-cooled transformers. Instead of measuring top oil temperature, as in the case of oil-filled transformers, the relay has a bimetal thermal strip in the hot air of the cooling ducts. The action of the relay starts fans and turns in alarms—like the oil-filled transformer.

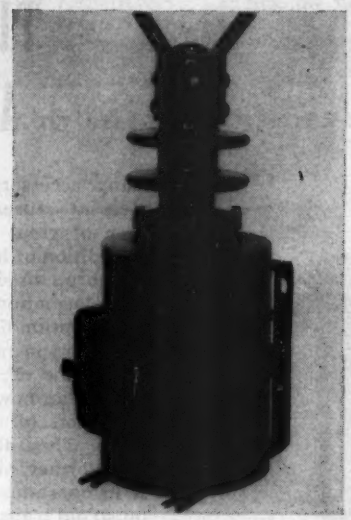
A new relay minimizes damage when an internal short generates a huge volume of gas. Transformers have relief diaphragms that act when internal pressures build up to an unsafe amount. But the new device does even better. It recognizes any uncommon rate of change of pressure and gives an alarm or removes the transformer from the line long before the relief valve can act. The relay detects a pressure rise of slightly over an ounce per square inch per second.

One manufacturer makes 38 standard transformer bushings to replace more than 1000 different bushings. This is a major step toward simpler stocks and faster emergency service.

More on next page

TODAY'S TRANSFORMERS AND ACCESSORIES . . . begins on page 114

PORTABLE current transformer measures current from 10 to 800 amperes by changing taps.



OUTDOOR current transformer is compound-filled for use in 15,000 volt service.

POTENTIAL transformer (outdoor type) is oil-filled. It is used up to 69,000 volts.

INSTRUMENT TRANSFORMERS

Instrument transformers are essential parts of many electrical measurement systems. Their qualities will affect directly the overall accuracy and performance of such systems. They transform high voltages and high currents down to values that are suitable for use with relays, meters, or other measuring devices, usually rated at 115 or 120 volts or 5 amperes.

A second and equally important function of the instrument transformer is this: to provide insulation between the primary and secondary circuits, thus simplifying the construction of the measuring and control devices and making them safer.

There are two general types of instrument transformers: (1) potential transformers, used in voltage measurements; and (2) current transformers, used in current measurements. Both types serve as insulators between the normally high-voltage primary and the low-voltage secondary circuits.

To be a useful part of a measurement system, instrument transformers must change the magnitude of the voltage or current that is being measured without introducing any unknown errors of measurement into the system. Either their accuracy of transformation must be a known value, so that the errors can be included in the computation of the overall measurement, or the errors must be within the limits of a specified small value, so that they can be reasonably disregarded.

Insulation is also one of the most important factors in instrument transformer design. Safety is a must as equipment and operators' lives may depend on the safe performance.

Limitations of space continually haunt the designer of instrument transformers. Improvements in recent years have been mostly reduction in sizes of transformers by using new methods and new materials.

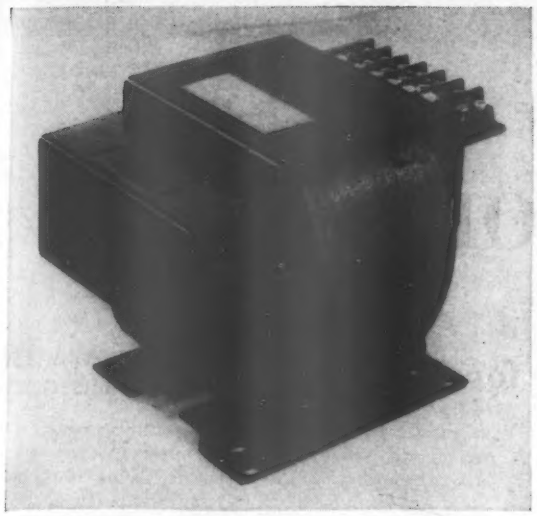
Potential transformers . . . In general, potential transformers for use on circuits rated 25,000 volts and above are suitable for outdoor service. Transformers below this voltage are made in two types—one for outdoor and the other for indoor use only. In this latter class are portable potential transformers used for test purposes. They are equipped with handles and may be especially calibrated for high accuracy testing.

Design changes by one manufacturer have reduced weights up to 60% in some ratings and have decreased dimensions by one third. The redesigned transformer has a completely welded heavy-gage case, so the unit is hermetically sealed, free from breathing.

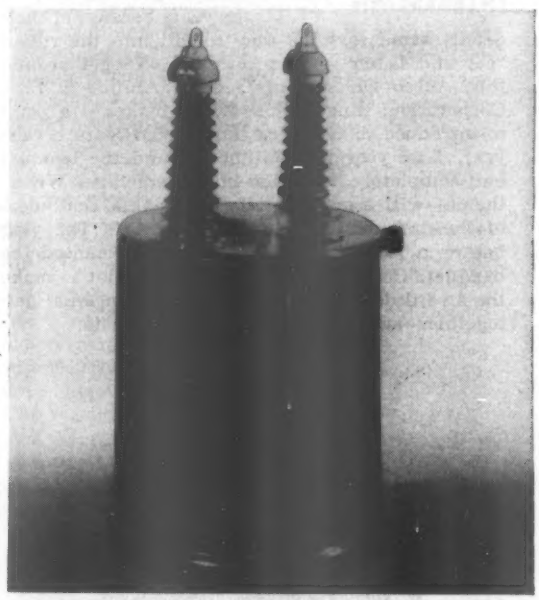
Plastic impregnation of outdoor potential transformers, 15 kv. and below, achieves a higher dielectric strength than is possible with oil. Yet it does away with maintenance of an insulating medium. With plastic impregnation there is no leakage, no contamination, and no chance for air to get into the windings. The plastic retains its superior insulating properties indefinitely without attention.

Current transformers . . . Current transformers are made in many different current ratios. In addition, various designs are insulated for use on different voltage circuits. Thus, the circuit voltage is as important a consideration in the selection of current transformers as it is for potential transformers. In general, transformers for use on circuits over 25,000 volts are suitable for outdoor use. Transformers for circuits below these ratings are made in two types—outdoor and indoor.

Current transformers 800 amperes and below are usually of the wound-primary type. Above 800 amperes, a straight copper bar extending through the core forms the primary. Another type has a hinged core which permits it to be assembled on buses without breaking the circuit.



MACHINE TOOL transformers supplies various voltages, for machine-tool accessories.



HIGH VOLTAGE transformer is used in equipment that takes smoke and dust out of the air.

Portable current transformers for testing are available in several styles to meet application requirements, such as accuracy and weight. These devices usually incorporate several windings, so a considerable range of current can be covered.

As in the case of the potential transformer, manufacturers are always trying to improve accuracy and obtain higher voltage ratings with a reduction in size, weight, and production costs.

Safety has not been overlooked either. A secondary short-circuiting device automatically protects the electrician against high open-secondary voltages. They can occur when the secondary of a current transformer is opened to disconnect an instrument or device from the line under load. Removing the cover over the secondary terminals automatically short circuits the two terminals.

SPECIALTY TRANSFORMERS

There are many uses to which transformers are put besides power distribution and instrumentation. One of the most common is for fluorescent lighting and neon signs. The small transformer in the ballast (as it is commonly called) steps up the line voltage to the voltage required to strike the lamp.

A new ballast on the market strikes two fluorescent lamps in series, using only the voltage ordinarily used to strike one lamp. This new development provides a drastic reduction in ballast size with reduced costs of production and, perhaps even more important with the present critical situation in raw materials, a reduction in the amount of material used.

The transformers used in neon signs and series cold-cathode lighting are mostly of the high-voltage, step-up type. Ordinarily 120-volt lighting circuit voltage is stepped up to 15,000 volts, but with very low current output. These transformers are built very compactly, yet safety must not be sacrificed to obtain these small sizes. Furthermore, inasmuch as these transformers are usually located in establishments where untrained persons have access to them, they must be foolproof in their safety features.

A line of machine-tool control transformers is now available. These transformers reduce the incoming line voltage to the machine tool (usually 440 volts to 110 volts) for use on the solenoid coils, relays, and contactors making up the machine-tool control. In some cases, the voltage is reduced to 55 or even 12 volts for use on safety devices on the machine. Also, it is becoming common practice to furnish each machine with localized lighting mounted on swivel brackets. These transformers provide the necessary 110-volt power for this lighting.

Transformers are now available for a source of high voltage in equipment for electrostatic precipitation of smoke, metals, and other materials from gaseous mixtures. These transformers, which are rated up to 25 kva., deliver up to 75,000 volts from a 240-volt source.

Transformers are built that maintain constant voltage for the most delicate electrical control equipment. One unusual case is that of an "electric ear." This device measures the noise from a grinding mill and controls the rate of feed when the noise level indicates that activity within the mill is slackening. The change in noise level required to acuse the electric ear control to adjust the rate of feed in infinitesimal, so it is essential that the power supply, which operates listening and recording functions, be absolutely reliable. Correction of line voltage variation of from 95 to 130 volts is instantaneous.

Specialty transformers control the many voltages required by the electronic engineers. There seems to be no limit to the various demands made of the transformer designers. Up to now, all demands have been met with a product that continues to be reliable, trouble-free, and requires less maintenance than any other electrical device.

TIPS TO GOOD HUMAN RELATIONS for factory executives

SAFETY FASHION NOTE FOR LADIES

Many a mere man is convinced that "the girls" in the shop would rather be pretty than safe—especially where their hair-do's are concerned. That's the reason for the safety hat, pictured above, which sets a new high in shop fashion. It's practical, too, says the firm that makes it—the Safety Division of The Boyer-Campbell Company, Detroit. Called "Ray-ve," the hat is light, and has an adjustable snood that covers any amount of hair. There's no peak, the manufacturer explains, because the girls like to push peaked caps back and leave a dangerous tuft of air in front. With this cap, it's claimed, they can't do that —and won't want to. Cost—$13.50 a dozen.

FUND RAISING— GOOD "BITE" BUT NO STING

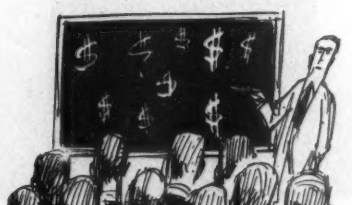
Dresser Manufacturing Division of Dresser Industries, Inc., Bradford, Pa., has its own stingless method of "putting the bite" on employees for contributions to deserving charities. Its Dresser Service League is an organization designed to let employees contribute by payroll deduction. Membership is strictly voluntary, and is almost 100%. Deductions are small—15¢ a week, but it adds up to a yearly total of $7.80 per employee. Supervisors and executives contribute more.

Each contributor gets an attractively printed card, certifying membership. On the back is a list of all organizations that will benefit; also an explanation of how the $7.80 is divided among them.

Best of all is this statement: "[The employee] should not be further solicited by any of these agencies during their annual fund raising drives."

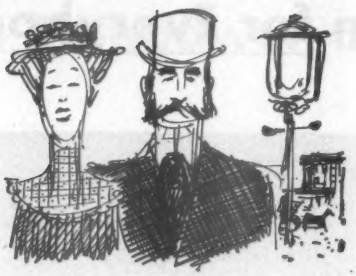
A WAY TO MAKE AWARD DINNERS INTERESTING

Employees often complain that service award dinners get duller with the years because of their deadly sameness. It's easy to fall into the rut of "eat and listen" year after year. To get around this, Ansco Division of General Aniline & Film Corporation, Binghamton, N. Y., makes it a point to introduce some interesting special feature each year. Last year the oldtimers found the banquet hall completely decorated in a "Remember When" theme—with a great variety of nostalgic reminders of the days of 1900. It was a big hit. The year before, a "Monte Carol Night" supplemented the banquet. Costs little extra, but does a lot to make the award dinners really lively and congenial get-togethers—something to look forward to.



NEW TRAINING COURSE COVERS INVESTMENTS

Your first reaction to the idea of offering workers a training course on the subject of investments is likely to be pretty cool. But the experience of B. F. Goodrich Company may give you reason to think twice. When it announced its four-session course in investments, 210 employees signed up. The course began January 23, was conducted by the New York investment firm of Merrill, Lynch, Pierce, Fenner, & Beane. Response like this is an excellent indication of the keen interest employees have in the economic facts of life—if you use the right approach.



TELL ABOUT THE GOOD OLD DAYS

How old is your employee magazine? If it's past its fifth birthday, you probably have the material for an interesting column in every current issue. Tell employees about the "good old days," an ever-popular subject, as the many newspapers that run such columns can testify. Weirton Steel's *Employees Bulletin* is a good example. Its feature is called "Looking Back Through the Bulletin," and has several items for each of three headings: 15, 10, and 5 years ago. Looks good, and many items are interesting even to the "outsider." The secret, of course, is to pick personals about people still well known in the company, or about important events that have wide interest value. Weirton does both.

SAFETY CONTEST FOR THE WHOLE FAMILY

Two contests are being used by Lehigh Structural Steel Company, Allentown, Pa., to help make safety a real *family* affair. The first contest is for a monthly safety slogan. The award is $5, and any employee or member of his family may compete. The winning slogan is posted throughout the plant.

The second contest is patterned after radio telephone quizzes. The trick is to repeat the safety slogan when called (or visited in person if there's no 'phone), plus the number of days the plant has operated without a lost-time accident. This figure is posted along with the slogan all over the plant.

To find out whom to call, the company's safety council draws the names of 10 employees every month. Calls are made in order of drawing. If the employee has a home 'phone, the call is placed, and exactly 10 rings are allowed. Whoever answers must know the slogan and the number of safe days to win. Where there's no 'phone, a company representative visits the home—once only.

Three winners are allowed per month. Prizes are $5 each.

HOW USEFUL ARE ANNUAL REPORT MOVIES?

Few firms, indeed, have used movies for annual reports. So, if popularity is any guide, it looks as if movies aren't practical for the purpose. But a recent experience of Reynolds Metals Company, Louisville, Ky., doesn't support this conclusion—at least for multiplant companies. Here's why:

Reynolds came up with its own homemade report in color movies, called *How We Did in 1949.* The film was released in April, 1950—just six weeks after figures were available. This is about as fast as you can get up many printed reports. And, because it was homemade, the total cost (including consultant's fee to write script) was only $6000.

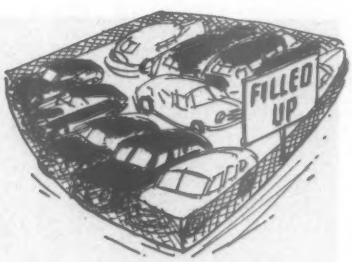
It was shown to 18,000 Reynolds employees in small groups. The cost per employee came out to about 33¢—a figure that compares quite favorably with the cost per copy of many elaborately printed annual reports.

As for impact, Reynolds reports excellent reactions from employees and supervisors.

The film takes 22 minutes to show, and is built around the experience of Joe Spellman, a typical Reynolds employee. Joe and his brother-in-law, a recently promoted plant accountant, talk about the 1949 sales record. Discussion is interesting.

ANOTHER WAY TO REMEMBER RETIREES

If you have an employee discount plan, let retired workers remain eligible. It's a simple, thoughtful gesture that will be really appreciated. A good example is the Westinghouse policy. Retirees can buy company products at a discount just as if they were still working. Only restriction—which actually applies to everybody—is that purchases must be for the retiree's own use. To simplify things still further, the old-timers don't have to apply in person for their employee-purchase certificates. They can write in for them.



WANTED—RUBBER PARKING LOTS

"We don't have any more employees, but our so-and-so parking lot's getting more jammed every day." Those are the words of the manager of a medium-sized plant. His problem is getting to be fairly common. And, since you can't make your parking facilities with a two-way stretch, now's the time to do something about them if they're getting cramped.

Reason for the trouble in recent years is simple—*more cars.* As the defense program grows, you may have more workers, too, and possibly more shifts. Add these together, and you may find you're heading for a real jam. As labor gets scarcer—and it probably will—it's things like parking lot jams that help your turnover to zoom.

Work Simplification for Everybody

WORKER LUFKIN HAS AN IDEA

LUFKIN USED TO WATCH while the machine milled slots in each load of thrust collars. Another operation was needed to burr the parts after milling. Lufkin's suggestion: Combine the operations.

WORKER BYERS HAS AN IDEA

BYERS POINTS to the idea that eliminated his own job—burring holes for groove pins in this power unit component. His suggestion: Change the pin length to make hole burring unnecessary.

Saves Manpower and Materials

NOW, LUFKIN BURRS one load of collars while another load is slotted by the machine.

NOW, BYERS USES the new groove pins on a subassembly job, to which he switched when his idea worked.

A similar plan worked for supervisors, so Maytag put in a broader plan to include all employees.

By J. F. BIGGANE • Chief Industrial Engineer
The Maytag Company, Newton, Iowa

WORK SIMPLIFICATION BY EVERYBODY is our prescription for the company that wants to save man-hours and materials. Today, after two years of experience, we're sure there is none better.

We want, at Maytag, to make every employee feel that he is an individual, not just part of the mass. He must feel that, through the suggestion system, he can reach top management with constructive ideas. We want him to feel that he contributes, through his suggestions, to the security of everyone at Maytag.

We were pretty sure a suggestion plan for all employees would work because we already had a program for supervisors. It was really cutting costs. Why not, we reasoned, get *more* savings by getting *more* people into the act? If we could get supervisors to contribute ideas, why not multiply the results by getting workers, too, to kick in with suggestions?

So we tried it. It was a big undertaking. It meant training all our operators and indirect workers—everybody below the supervisor level. But it was successful right from the start. The first year we got ideas from workers that saved $31,000 in man-hours and materials. We thought that was pretty good because only 20% of the people were trained at the beginning of the year.

That was in 1949. Savings nearly doubled the second year, to $54,000. We look for even bigger returns this coming year.

I should add right here that the work simplification program did a whole lot toward improving employee attitudes.

As one man put it: "I'd rather work at Maytag than anywhere else because they listen to my ideas—and pay me for the good ones."

Another said: "I've worked for a lot of companies, but Maytag's the first to explain to me the importance of eliminating waste."

But let me tell you, play by play, how we planned, set up, and carried out our program:

1. STARTED OUR IDEA PLAN . . . First thing we did was install a good suggestion system. It's the thing you need to make your work simplification plan work. Employees will make suggestions when you pay for them. And competition is one of the things that moves an operator to submit an idea. He wants to submit the idea before somebody else does—and beats him to the award. We looked at a number of suggestion plans and cut ours to fit conditions at our company. We call it the "Employees' Idea Plan."

2. DECIDED ON CONDENSED TRAINING . . . How much training? A natural question because we had to pay people while attending classes. Our course couldn't be too long. But it had to be long enough to permit adequate coverage of the subject.

We had trained our supervisors in a series of nine

2-hour conferences—18 hours per man. But, by eliminating portions that seemed unnecessary for workers, we were able to cut the course down to 10 hours —four sessions of 2½ hours each. Here's the outline of the course:

Session 1

a. Principles of "Employees' Idea Plan"
b. Personal desires
c. Security and its relation to productivity, real wages, and prices
d. Waste of supplies, materials, tools, equipment

Session 2

a. Speedup vs. motion economy
b. Effect of machinery on employment
c. Competition; relation of cost and price to sales

Session 3

a. The flow process chart (each employee makes a sample chart)

Session 4

a. Details of "Employees' Idea Plan"
b. Summary and review

We also prepared a booklet to use as a text. Each employee was given a copy to keep. The thought was that he could use it occasionally to refresh his training—and to help him work up his ideas.

3. GOT THE WORD AROUND ... We were now ready to present the program to the employees. We spread the news by talking it over with the officials of the local union. Then we gave them the condensed course —and asked them what they thought of it. They did not oppose the plan, or criticize it in any way. We got their wholehearted cooperation—and with it the assurance of cooperation from employees.

4. PICKED TWO MORE INSTRUCTORS ... When we started our program for supervisors, we had to have trained instructors. To get them, we asked supervisors in the shops and engineering departments to suggest likely candidates from among employees and supervisors who were then given personality and ability tests by an industrial psychologist. Two were chosen, one supervisor from the shops, one employee from factory engineering. We sent them to Allan H. Mogensen's Lake Placid conferences for training in the fundamentals of work simplification.

These instructors were used at the start of the program for workers. But they were being kept so busy with supervisors' suggestions that we had to have more help. So we selected two more men to go to Lake Placid for training.

5. GOT OUT THE BUGS ... Before starting to train in a big way, we gave the course to a pilot group. This was to get out the bugs. The 12 people in this group were chosen with great care. They represented a cross-section of all workers as to age, length of service, sex, temperament, and type of work performed.

6. TOOK ONE DEPARTMENT AFTER ANOTHER ... The machine shop was first on our list. We thought we could get quick results there. Each worker attended one session a week, within his working schedule, for four successive weeks. Then we went on to one department after another. Workers in each department were allowed to submit ideas as soon as all workers in the department were trained.

7. GOT A GOOD RESPONSE ... It wasn't long before the ideas began to hatch. We got 20 during the first three weeks after the first group—140 people—had completed their training. They were good ones, too. At the end of the first year we had received 169 ideas from 1262 employees (total factory employment—1500 people). Of total ideas submitted, we accepted 47%. The average award was $81.76. Total savings, as already stated, reached $31,000 per year.

8. FACED OUR TROUBLES ... Did we have troubles? Yes, indeed. But we faced them. We worked on them. And they faded away.

Number one: Employees feared layoff as a result of increasing production per man-hour. We discussed this problem during the training program and stated our policy: *Employees on eliminated jobs would be transferred to other jobs.* We've done that in a few cases and no one kicked.

Number two: Before this program began, older operators accused foremen of ignoring their ideas and later making the same suggestions and taking credit for them. The investigating procedure we set up soon put an end to that gripe.

Number three: Employees believed time standards would be cut too much when an improved method was installed. We promised we would change the time of just those elements of the operation that were affected. And we've stuck to that practice rigidly.

Number four: We've met resistance to the installation of some ideas only because all the details were not clearly understood. Let me illustrate. One idea proposed to combine two operations and eliminate one operator. The men doing this work said it wouldn't work because each had to watch his machine continuously to avoid producing scrap pieces. Their argument didn't make sense because calculated observation time was ample for the extra work. We insisted on a trial run with one operator. The operators were right. Scrap *was* excessive. We found the cause, too—the machine needed overhauling. When that was done, we tried it again, and scrap was within bounds. The idea was installed. The operators were unhappy about it for a while, but a little time found the new method up to expectation.

9. KEPT THE PROGRAM ALIVE ... We heard that some programs like ours worked well for a while, then gradually died. You have to give any program an occasional boost if you want to keep people interested. We've kept our program active with several devices:

- Foremen present awards with simple formality.
- Company publication reports ideas installed.
- We film installed ideas, and send film, equipment, and projectionist to show in employees' homes when requested. We also use the films to train others.
- We place posters in strategic spots throughout the plant. They describe successful ideas, name the suggestors, and state the awards.
- Investigator explains reasons for rejection of an idea to the employe before he is advised by letter. At the same time he is urged to try again.

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Putting the wrong steam trap on a process line is like putting a brake on productivity. You cut output, sometimes spoil quality. This article, based on a chapter from the author's forthcoming book on industrial piping (McGraw-Hill Book Company), tells . . .

HOW TO PICK THE RIGHT STEAM TRAP

By CHARLES T. LITTLETON
Piping Engineer, Lawrenceton, Novia Scotia

THE MOST IMPORTANT THING about a steam trap is that you pick the right trap for the job. No amount of good maintenance will make the wrong trap right.

There are many good makes of steam traps on the market. All too often a good trap does not suit the purpose for which it was installed. From then on that particular trap gets a black eye, although it might be just the one you should use in another application. Chief factor in the choice is type of service. A steam trap does either of two jobs:

1. Removes condensate from steam mains, steam headers, separators, purifiers, and so on.

2. Removes condensate from heated units such as coils, steam jackets, water heaters—any equipment where you need dry steam of a desired temperature.

In the first group the service is primarily one of ridding the system of condensate and such water as may have been carried over from the boiler. Here the quantities of air to be handled are comparatively small, except at the end of long runs or during the warming-up period. In this group, traps must have enough excess capacity to handle large amounts of water above what would be normally present.

Traps for service in the second group have to do more than handle condensate. They must also purge the apparatus of considerable quantities of air or incondensable gases so that the unit can be kept filled with hot, dry steam.

Entrapped air dilutes the steam and reduces its temperature. This lowers the heat-transfer rate, which depends on the temperature difference between the steam and the substance being heated. For example, the temperature of saturated steam at 50.3 lbs. psig. is 298 degrees F. But a mixture of steam with 10% air drops this temperature 7 degrees F.—20% air drops it 14.5 degrees F.

WHAT TYPE TRAP

Here is a summary of good practice today in the choice of various common types of traps.

Inverted Bucket · This is probably the most widely used type for ordinary pressure and capacities up to 15,000 pounds per hour. Forged steel inverted bucket traps are now on the market designed for a maximum steam pressure of 2400 psig.

Where you have to purge large quantities of air during heating-up portions of a cycle, you can get this trap equipped with an auxiliary air vent.

Advantages of this type of trap are (1) the speed with which it disposes of condensate, and (2) the elimination of steam losses. Be careful to specify the correct operating pressure, or your trap won't work.

Disadvantages are the limits in capacity, and unsuitability of this type for outdoors where it might freeze and ice-bind during a shutdown.

There are variations in design. You can facilitate piping work by choosing a trap with inlet and outlet in a straight line.

Piston-Operated Compound · This is used where large volumes of condensate must be handled. You can get traps with capacities up to 240,000 pounds per hour in the 600-lb. pressure class.

Where sudden loads must be handled quickly, be sure to vent the trap on top to a high point of the steam system.

Open-Bucket · Engineers recommend this type for draining steam lines subjected to pulsations and wide pressure fluctuations. It automatically vents air and gases.

Float · This type is used to discharge condensate continuously, practically at steam temperatures. It operates without pressure fluctuations often encountered in the use of intermittently operated traps.

A basic defect is its inability to purge the system of air. To overcome this, it is often equipped with an auxiliary thermostatic vent that opens for air or gas but shuts off for steam.

Thermostatic · You can use this trap anywhere on low- and medium-pressure systems. But it works particularly well outdoors because it won't freeze. The trap is normally open, so that all water may drain in case of a shutdown.

There is bound to be a lag between the time the condensate hits the thermostatic bellows and when it has cooled sufficiently to open the valve. In most installations this lag is not important.

Impulse · Big advantage is compactness in design, hence it takes little space. This trap is made for pressures up to 600 psig. Capacity claimed for it, however, compares favorably for a given size and pressure rating with either the inverted bucket or thermostatic trap.

Liquid Expansion · Good for service where steam pressure is reasonably constant. This trap discharges condensate at temperatures as low as 180 degrees and not higher than 212 degrees F. Therefore it is suitable for piping systems where condensate is not utilized, but wasted. Only a minimum amount of latent heat remains in discharged condensate—there is no flash steam at the discharge point.

You can adjust this trap to provide a continuous flow of condensate at a predetermined temperature.

WHAT SIZE TRAP

The practice of selecting the trap of a size equal to the drain connection from the heater or piece of equipment often is a wasteful procedure. For each installation four factors enter the calculation: (1) maximum pressure, (2) working pressure differential, (3) safety factor, and (4) anticipated condensate load.

1. *Maximum pressure.* This is the initial pressure

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Sunvis H.D. 700 Oils are specially developed for modern circulating systems on machines operating where contamination is a troublesome factor. Sunvis H.D. 700 Oils are extremely stable and have long life even under the most adverse conditions. They have inherent rustproofing characteristics, and the high film strength needed to eliminate scoring on heavily loaded antifriction type bearings.

Sunvis H.D. 700 Oils are also fully detergent, dispersive, and resistant to foaming, and are available in all required viscosities.

For further information about Sunvis H.D. 700 Oils, write for booklet F-3.

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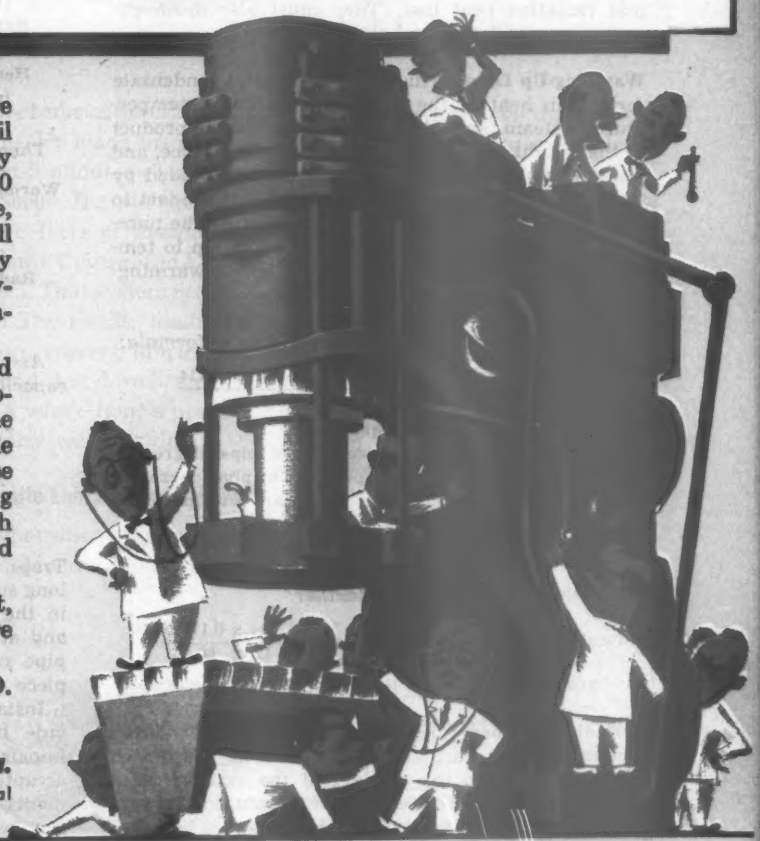

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at source of supply, such as the boiler, steam take-off, or the downstream side of a pressure-reducing valve.

2. Working pressure differential. This is the algebraic difference in pressures at the trap inlet and at the vacuum or back pressure in the return due to discharging the condensate to an overhead line. For every 2.3 feet that the condensate is lifted, the back pressure is increased 1 pound. Where fluctuations in pressure occur, *always take the maximum pressure* to determine the size of trap orifice required.

3. Safety factor. In the determination of steam-trap requirements this is the ratio between the actual continuous discharge capacity of the trap and the amount of condensate to be handled. One manufacturer recommends safety factors from 2 to 8, depending upon the amount of air to be eliminated as well as the sizes and number of pieces of equipment to be drained. Others recommend the choice of a trap of 50% to 400% greater capacity than the calculated loads, i.e., safety factors 0.5 to 1 to 4 to 1.

4. Anticipated condensate load. Where steam pressures remain fairly constant, the calculated quantity of condensate multiplied by safety factor gives the required continuous discharge rate of the trap. Where steam pressure is constant but the condensing rate of the equipment varies, always use the maximum rate times the safety factor.

Traps for draining steam headers must handle the condensate load when the steam is admitted (warming-up load), as well as the condensate due to normal radiation heat loss. They must also drain entrained water from the boiler.

Warming-Up Load • This is the amount of condensate formed in heating the pipe from its initial temperature to steam temperature. It is equal to the product of the weight of pipe, the temperature difference, and the specific heat of the pipe material, all divided by the latent heat of the steam. Convert this product to pounds of water per hour by dividing it by the number of minutes required to bring the pipe up to temperature and multiplying it by 60. A 5-min. warming-up period is the maximum to use.

This calculation may be expressed as a formula:

$$\text{Condensate (lbs.)} = \frac{W \times (T - t) \times 0.114}{L}$$

where W = total weight of pipe
T = final temperature of pipe, degrees F
t = initial temperature of pipe, degrees F
L = latent heat of steam at final temperature
0.114 = specific heat of steel or wrought iron

Developing this formula further:

$$\text{Condensate (lbs. per hour)} = \frac{W\ (T - t) \times 0.114 \times N}{L \times 60}$$

where N = number of minutes required to warm up.

Radiation Load • The steam condensed by normal radiation from insulated pipe carrying saturated steam is equal to the product of the external area of the pipe in square feet, the temperature difference between the pipe and the outside air, and a heat loss quantity in Btu., depending upon the type and thickness of insulation, all divided by the latent heat of the steam.

The warming-up load decreases as the radiation load increases, the peak occurring midway through the warming-up period. Therefore, add only one-half the normal radiation load to the warming-up load. You can disregard this quantity in the case of well-insulated lines, as it constitutes such a small percentage of the warming-up load.

For traps installed at the end of the steam main or just ahead of pressure-reducing and stop valves that are closed part of the time, use a factor of safety of 3:1. Traps adjacent to the boiler should be oversized according to the probability of prime being carried over from the boiler.

Calculation: Let's work out a calculation of an actual problem in sizing a steam trap:

Problem: 150 ft. of 6-in. schedule 40 pipe carrying 200-psig. saturated steam is insulated with 2-in.thick 85% magnesia. Assuming the room temperature to be 50 degrees F., and the warming-up period to be 5 minutes, what should the trap capacity be?

First you assemble these data:

6-in. schedule 40 pipe weighs 18.974 lb./ft. (from pipe data)
Temperature of 200-psig. steam = 388° F. (from steam table)
Temperature difference = 338° F.
Specific heat = 0.114
Latent heat of 200-psig steam = 837 Btu. (from steam tables)
External area of 6-in. pipe = 1.73 sq. ft./ft. (from pipe data)
Heat loss through 2 in. of 85% magnesia (from insulation tables) = 0.286 Btu./sq. ft/deg. F/hr.

Then you calculate the condensate loads:

$$\text{Warming-up load} = \frac{150 \times 18.974 \times 338 \times 0.114 \times 60}{837 \times 5}$$

$$= 1570 \text{ lb. per hr.}$$

$$\text{Radiation load} = \frac{150 \times 1.73 \times 338 \times 0.286}{837}$$

$$= 30 \text{ lb. per hr.}$$

Assuming a factor of safety of 2, the required trap capacity therefore is:

$$2\left(1570 + \frac{30}{2}\right) = 3170 \text{ lb. per hr.}$$

HOW TO INSTALL

Traps should be installed every 300 to 800 feet on long supply mains and at each natural drainage point in the line, such as before reducing valves, risers, and at low points. Locate traps at the end of each pipe run and before every branch connection to a piece of equipment.

Install a Y-type strainer before each trap. Provide bypasses for all traps that would seriously impair operations if removed. An alternate plan, accepted increasingly by plant maintenance departments, is to standardize the lengths of connecting trap nipples. Then in case of failure you can replace a trap in a matter of minutes and repair it in the shop. Don't forget to provide a test connection after the trap so you can check if it is functioning properly.

Every Minute Meant a $1920 saving

Big return for a minute's time . . . but to a leading Philadelphia manufacturer* a 5 minute interview did result in a total saving of $9600.

This manufacturer faced a problem that's common to many plants today. His ten machines have 560 bearings—560 bearings that must be kept lubricated if production is to be kept uniform, rejects few. That lubrication job was taking four man hours every week and, because of human fallibility, there was always the potential danger that one of these many bearings had been overlooked or under lubricated.

An Alemite Lubrication Engineer was called in. He made his presentation in just 5 minutes—5 minutes that saved $9600. He told the manufacturer the facts of installing a modern Alemite Centralized Lubrication System. That system is in the plant today. The result: assurance of continuous, correct lubrication, few rejects and shut downs, and the addition of a whole hour's production time every working day.

Call Your Alemite Lubrication Engineer

No matter what size or type of plant you operate, Alemite can show you dozens of ways to save through the more efficient handling of petroleum products. Call your local Alemite Industrial Distributor now or send for the free booklet "11 Ways to Cut Production Costs." Simply attach the coupon below to your letterhead. Dept. G-31, 1850 Diversey Parkway, Chicago 14, Illinois.

*Name on request.

ALEMITE

REG. U.S. PAT. OFF.

MEANS EVERYTHING FOR LUBRICATION

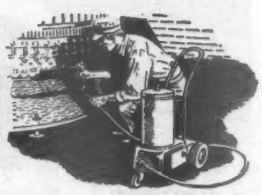
1. Methods 2. Lubricants 3. Equipment

Another Product of Stewart-Warner

Alemite Cuts Costs 3 Ways

1. In transferring lubricants . . . cuts man hours 63% for every 100 pounds transferred. No mess, no contamination.

2. In loading grease guns . . . saves 3¾ man hours for every 100 pounds of lubricant loaded into hand guns.



3. In applying lubricants . . . saves up to 23.9 man hours for every 100 pounds of lubricant applied to bearings.

FREE! Valuable booklet—
"11 Ways to Cut Production Cost"
(Simply attach to your letterhead)
ALEMITE, Dept. G-31
1850 Diversey Parkway, Chicago 14, Ill.

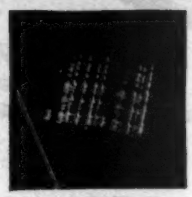
We'll include facts on the new Alemite Oil-Mist System, too—(OIL-MIST atomizes oil into mist, circulates it to bearings under pressure. Increases life of bearings as much as 17½ times).

Name.....

Company.....

City..... State.....

TINIEST MIRROR . . . less than 1/8 in. in diameter, reflects light, periscope style, through a 2-ft. tube to an eyepiece. Here an inspector uses mirror to check machining on the inside diameter of a forging. He's looking for chatter marks or tool scratches and may see something like this in his mirror. ——→



MOST DELICATE MIRROR . . . enables Du Pont scientists to study paint film characteristics, magnified 4000 times. This mirror is geared to a stylus that is drawn over the surface to be studied. It reflects a pinhole image through an optical system onto photo film, producing this sort of pattern. ——→

DOING IT WITH MIRRORS

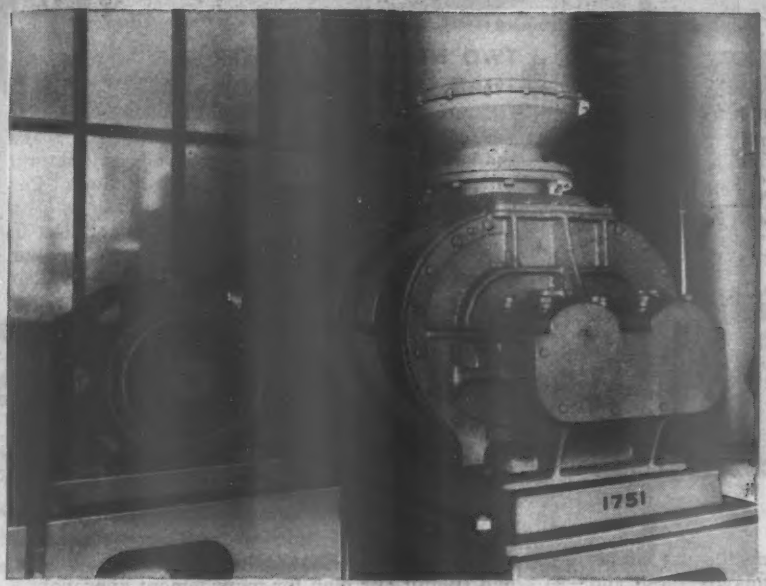
Du Pont engineers have gone through the looking glass for short-cuts to more efficient plant operation. They've found wide use for the common mirror in production and research jobs that baffle the unaided eye. Here are some of their mirror ideas.

IN THE YARD . . . big traffic mirror mounted at blind corner warns plant worker that one of the company trucks is coming 'round the bend.

IN THE SHOP . . . mirrors are used on assembly lines to check the inside of shotgun shells for possible defects before they are loaded.

IN THE POWERHOUSE . . . station operator checks steam gages 32 feet above in a mirror located at just the right angle on the main floor.

NO V-P-L WORRIES WITH R-C BLOWERS



ROTARY

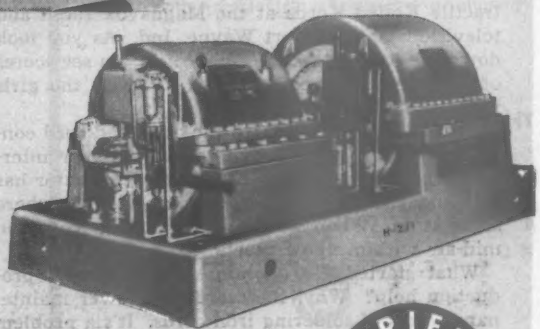
Rotary Positive Blower for pneumatic conveying in large eastern processing plant. Many other R-C units are used in various plants of this same company.

Today's production urgencies call for "no-vacation" performance from blowers and other equipment to move gas and air. You must be sure of positive Volume, at the required Pressure, and at Low power cost to keep down rising expenses. The answer is Roots-Connersville Blowers with V-P-L.

You obtain this freedom from worry whether you install R-C Centrifugal or Rotary Positive equipment. This exclusive *dual-ability* gives you the choice of either type to best meet your requirements. Wide latitude in sizes, from 5 cfm to 100,000 cfm, permits selection of units with capacities close to your specific needs. Often, this flexibility saves time, cost, space, weight and power charges.

R-C engineers will gladly counsel with you on any problem of moving or measuring gas or air to keep production going.

ROOTS-CONNERSVILLE BLOWER CORPORATION
510 Central Avenue, Connersville, Indiana



Two, 4-Stage, Type H Centrifugal Compressors, mounted on common base. Motor driven, with capacities of 11,230 cfm and 8,990 cfm, respectively.

CENTRIFUGAL

ROOTS-CONNERSVILLE

BLOWER BUILDERS SINCE 1854

ONE OF THE DRESSER INDUSTRIES

MAINTENANCE POINTERS FOR FACTORY EXECUTIVES

IT'S THE EXTRA TOUCH THAT COUNTS

In this case, the extra touch was the use of retractile Koiled Kords at the Magnavox radio and television plant in Fort Wayne, Ind. As you look down the long chassis assembly line you see scores of these cords dancing up and down as the girls wield their fine-tipped soldering irons.

There's no slack, ever, in the overhead cord connection. It's always out of the way, never interferes with other movements. Yet the operator has full and easy control to pin-point the tip where she has to. When not in use, the iron hangs in mid-air within elbow reach.

What started the adoption of this simple production help? Why, the search for lower maintenance costs of soldering iron cords. It's a problem in many plants. Magnavox set out to find an answer. It has cut cord maintenance costs 90%.

HOW TO CUT DOWNTIME LOSSES FROM ANTI-FRICTION BEARING FAILURES

Most bearing failures, says the Anti-Friction Bearing Distributors Association, Cleveland 15, are caused by faulty maintenance practices. It proposes to help conserve bearings by making available a continuing study of bearing maintenance techniques in pamphlet form, called "Bearing Maintenance Report."

Reports will describe procedures for successful installation, maintenance, and removal of all types of anti-friction bearings. You can get this service free by a letter request to the Association. It will send you a file holder in which to compile all reports as they are issued. First report is now ready.

TWO HEADS ARE BETTER THAN ONE, EVEN IF...

. . . one is a cabbage. It's an old saying that means you can always profit from a confab. And that's the basis of a technique that's proved very helpful in production troubles at Packard Motor Car Company, Detroit.

Hear what Ken Parker, plant engineer, has to say: "Whenever we run into equipment trouble, we consult *everybody*. Maybe the trouble is poor quality, or poor volume, or equipment running uneconomically. Or possibly the service facilities —electrical, water, air, and so on—are not properly designed or not working as they should. You can't tell—it may be any one or a combination of these factors.

"So what do we do? We call together the electrician, pipefitter, iron workers, and production men, everybody involved in the *operation and maintenance* of this equipment. We list all their gripes in an office bull session. Then we go down the list and plan how to make everything right and submit our plan for management approval.

"The result? Very much worthwhile, if you interpret reduced maintenance and improved quality that way."

HOW YOU CAN TELL WHEN FILTERS ARE DIRTY

Dirty filters cost you money. Clogged air filters boost the power bill. Dirty liquid filters slow up or spoil the process.

The usual way to check filters is by guess and b'gosh, but you *can* be more scientific. Take air filters, for example. Engineers know that the resistance the air meets in passing through the filter shows its condition. So all you need do is install a gage that tells on a large dial the amount of resistance. You can arrange for a light to flash or alarm to sound when the resistance gets too high. For details on such equipment, write the Hays Corporation, Michigan City, Ind., for Bulletin #48-751.

Filters for liquids—solvents, wash waters, emulsions, and so on—are often left in service long after their economical service. In this case a "window" in the discharge pipeline will tell you how the filtrate looks. If you add a meter that shows the amount of flow, you've got a combination that tells you everything—clarity of liquid, and if and how fast it's flowing. You can get such a combination in one instrument. Fisher & Porter, Hatboro, Pa., will tell you about it.

More on next page

Now Available

NEW CLASS H*

MOTORS PROTECTED BY DOW CORNING SILICONES

... the insulation that has already saved industry millions of maintenance dollars plus the hourly output of hundreds of thousands of men!

This most timely announcement caps the test program we started 8 years ago when silicone resins were introduced by Dow Corning Corporation. First we proved by accelerated life testing that silicone insulated motors had a good 10 to 1 advantage in life expectancy and wet insulation resistance. Then we sold silicone (Class H) insulation to the manufacturers of electrical equipment ranging from lift truck and traction motors to solenoid and brake coils. We also encouraged the better rewind shops to rebuild hard working industrial motors with Class H insulation.

Now we can proudly refer American industry to this goodly list of electrical manufacturers, all able and willing to supply electric machines protected by Class H insulation made with Dow Corning Silicones.

Take your special problems to the application engineer representing any of these companies or to our Product Development Engineers.

furnished by:

ALLIS-CHALMERS MANUFACTURING COMPANY

Continental Electric Co., Inc.

ELECTRO DYNAMIC

ELLIOTT COMPANY

KURZ & ROOT COMPANY (INCORPORATED)

The Leland Electric Co

THE LOUIS ALLIS CO.

The Reliance Electric & Engineering Company

THE B-A-WESCHE ELECTRIC COMPANY

WELCO

WESTINGHOUSE ELECTRIC CORPORATION

THE MASTER ELECTRIC COMPANY

MASTER

* "Class H" insulation is the kind of insulation that keeps motors running in spite of "Hell and High water." *(slanguage dictionary)*

DOW CORNING CORPORATION

DOW CORNING SILICONES

MIDLAND, MICHIGAN

MAINTENANCE POINTERS

Begins on page 132

SEE IF YOU CAN BEAT THIS COST

The problem was to repaint a 300,000-gal. water tank—36 feet in diameter and 40 feet high. Sure, Fairchild Aircraft of Hagerstown, Md., knew it could be done, but at what a cost! Engineering brain cells got to working and came up with the idea of installing a "runner" on top of the tank. The runner pivots at the top center and can be pushed around the circumference on wheel supports at will. You can sling a swing or a bos'n's chair from the boom, and spot yourself easily on the side at any height or point of compass.

This contraption more than paid for itself in the first painting. These figures show why. Total manhours were 152 hours for wire brushing, scaling, one primer coat all over, and one color coat plus two cover coats on top. Materials used were 7 gallons of primer, 9 gallons of color paint, and 4 gallons of turpentine.

Fairchild made and installed its own runner out of scrap in 22 hours. You can buy this equipment, too. We happen to know Up-Right Scaffolds, Teterboro, N. J., sells it, also a safety cage that rolls around the tank side.

GO EASY ON THE WHISTLE, BOYS—IT MAY COST GOOD WILL

Time was when every plant said "Get to work" by the whistle. Didn't make any difference what the shift—morning, evening, or midnight.

Lots of plants are still doing it, and some are losing friends thereby. Particularly those in city environs, or where three-shift operations prevail.

We know of one plant that recently wised up to the consequences: disgruntled neighbors, and loss of valuable sleep by some of its own workers who were waked up by the whistle. The plant engineer in this plant inserted a program timer into his plant broadcasting system. He added a variable oscillator to feed a whistle signal into the circuit. Its tone could be set wherever most effective, yet it is not heard outside the plant.

Cost was moderate, benefits incalculable but positive. Only one complaint: Mrs. Jones had to buy an alarm clock. The whistle no longer woke her up at 7 every morning.

GOOD WAYS TO SOLVE SPECIAL PLANT ENGINEERING PROBLEMS

IS DUST GETTING IN YOUR HAIR?: Pangborn Corp., Hagerstown, Md., discusses the subject in its 50-page free booklet on "Industrial Dust Control Throughout Exhaust Systems." It's good, instructive reading on all phases of the problem, including maintenance.

WHEN INSPECTING OR REPAIRING IN DARK PLACES: Shatterproof fluorescent Vaportite portable light may be the answer. It's said to be dust-tight and moisture-tight as well. Ask Commercial Reflector, Los Angeles 11, for bulletin No. 4.

NEED A SAFE HYDRAULIC FLUID?: Ucon Hydrolubes were designed for use where fire hazards exist. Have other unusual properties, too. Descriptive booklet from Carbide and Carbon Chemicals Division, New York 17, is an eye-opener.

IF YOU WORK WITH POLYPHASE CIRCUITS: A phase-sequence indicator saves you time on hookups. You don't have to guess when connecting leads, or to use a test motor. Bulletin 7A from Associated Research, Inc., Chicago 18, tells how and why.

TO PROTECT TUBING IN CORROSIVE AREAS: You can get Samuel Moore & Co., Mantua, Ohio, to coat your own tubing for you before installation. It will extrude a coating of vinyl or polyethylene over instrument tubing or fluid transmission lines up to 3 inches OD—in whatever thickness you want.

NO SHUTDOWN TO CLEAN CLOGGED PIPE STRAINER: Not if you are using its scraper strainer, says Sarco Co., Inc., Empire State Bldg., New York 1. Can be hand-operated or motor-driven. Ask Sarco for bulletin No. 1225-A.

WHAT VAPOR PURIFIER IS BEST?: Selection of right kind and size is made easy for the plant engineer, says Centrifix Corp., Cleveland, by its 8-page manual. Covers entrainment problems in vapor, steam, gas, and air, in theory and practice.

WHERE CAN I GET THAT PLUMBING FIXTURE PART?: Maybe J. A. Sexauer Mfg. Co., Inc., New York 51, can tell you. It offers an illustrated 118-page catalog that shows over 2500 repair and maintenance items for plumbing fixtures.

are dirty, dangerous floors "strangling" your production?

Kill this menace with "THE MYCO METHOD OF FLOOR MAINTENANCE"!

Slyly, and without let-up, dirty, slippery floors throttle production with accidents, sickness, working handicaps and inefficiency.

"The MYCO Method of Floor Maintenance" halts this plundering . . . gives cleaner, safer, longer-wearing floors . . . steps up efficiency, and reduces maintenance costs.

Masury-Young's superior floor cleaners, dressings, tools and mechanical equipment are the best that modern research can offer for quality, performance and value.

FREE! Leading industries use this free floor-improvement plan

You, too, will profit by the *free services* of our expert floor technicians who carry out this floor-improvement program in your plant:

1. **SCIENTIFIC SURVEYS** of your floors
2. **RECOMMENDATIONS** for treatment
3. **PERSONAL INSTRUCTION** of your staff
4. **PERIODIC INSPECTIONS** and reports

ALMOST A CENTURY OF SERVICE SPEAKS FOR ITSELF!

Don't gamble! Give your floor problems the benefit of Masury-Young's specialized experience and "know-how." Prompt service — anywhere.

FOR VALUABLE, FREE FLOOR-CARE BOOKLET CALL OR WRITE NEAREST MASURY-YOUNG OFFICE

WHAT'S NEW IN EQUIPMENT... BRIEFED HERE

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MISCELLANEOUS 188

CLOSEUP OF GILMER BELT shows how belt teeth and pulley grooves mate to give positive drive and split-second timing at high or low speeds.

IN THE NEXT ISSUE

Some notes on important late items. More about them next month.

Shelving Supports • called Uni-clips—snap in and out of vertical channel frames with ease. Each clip supports one corner of adjacent deckboards, permitting continuous shelving. You adjust Uni-clips with thumb and forefinger to desired height.

Unistrut Products Co., 1013 W. Washington Blvd., Chicago 7.

Three-Wheel Hand Truck • Women workers will like this one. They'll need neither physical strength or balancing skill to handle loads up to 400 lb. A foot-operated lever unbalances the truck load onto a tripod support for ease in handling.

Melooz Mfg. Co., 4730 Avalon Blvd., Los Angeles.

Plastic Goggle Lens • guaranteed unbreakable by manufacturer—also pit-proof and optically correct.

The Goggle Parts Co., Cleveland 13, Ohio.

Toothed Belt Gives Precision Drive

A RUBBER-AND-FABRIC DRIVE BELT that can't slip—said to give you precision timing at speeds up to 16,000 fpm.—has been developed by the Gilmer Div. of U.S. Rubber. The Gilmer timing belt is designed to do this—and more—because it has teeth that engage with grooves in both drive and driven pulleys.

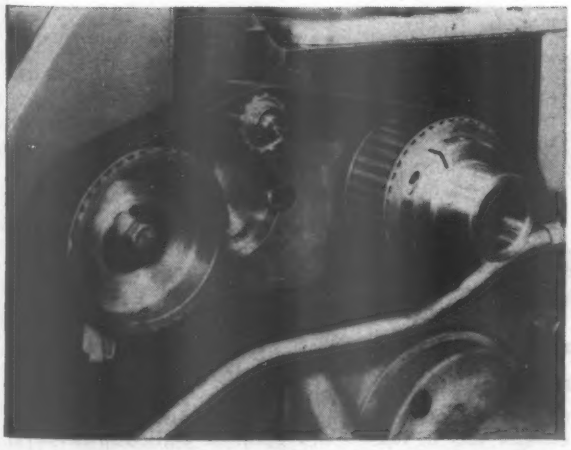
Positive engagement of belt and pulley eliminates slip, creep, and speed variation. These features promise to bring greater uniformity in the productive rate of industrial machinery. In piece-work operations the Gilmer belt will cut out production losses due to belt slippage in otherwise identical machines.

Maintenance-wise the Gilmer belt is an eyeopener, too. Steel cable reinforcing prevents elongation and provides greater pulling power. The belt operates on fixed centers—it needs no takeup adjustments. There's no initial tension. So you get high efficiency with low bearing pressure.

The compactness of the drive affords substantial space saving in many applications. Speed ratios are practical up to 30:1. Belt flexibility, says the maker, permits pulley diameters as small as ½-in. at 10,000 rpm. even with heavy load.

Gilmer is currently limiting production to specially engineered applications. But they are working on a standardized line of stock drives for the replacement market. They also see a future for their toothed belt in synchronized conveying.

L. H. Gilmer Div., U.S. Rubber Co., Philadelphia 35, Pa.



PRECISION TIMING at high spindle speeds is a must on automatic screw machines. Oil that accidentally gets on this Gilmer drive can't cause slippage.

Self-Aligning Pillow Blocks

The labyrinth seal in a new line of bearings automatically provides the correct amount of lubricant. Excess grease escapes under pressure. The lubricant is sealed in—dust and dirt are sealed out.

These seals are used on a line of precision ball bearing pillow blocks and flanged cartridges in shaft diameters from ½ to 1¼ in. Outside diameter of the chrome alloy bearing is spherically ground to permit shaft alignment and simplify mounting.

Boston Gear Works, 62 Hayward St., Quincy 71, Mass.

Sealed Bearing With No Mechanical Contact

The R. F. Series ball bearing combines the advantages of a sealed bearing with the freedom of rotation of an open bearing. It's sealed without any mechanical contact between stationary and rotating members.

The tapered section of the inner race and a cylindrical extruded section on the inner cover form a capillary chamber. A permanent film of oil in this chamber seals the bearing. The high precision bearings come in bore sizes from 3 to 8 mm., outside diameters from 10 to 22 mm.

Landis & Gyr, Inc., 104 Fifth Ave., New York 11.

Friction Clutch and Brake Unit

Accessibility is the main feature of a new air-powered friction clutch and brake unit. You can change shoe and lining assemblies in a matter of minutes. All other wear parts—driving mechanism, pistons, piston packings, and springs—can be removed without special tools while the clutch is mounted in the machine.

The clutch and brake unit can be used on presses, rolling mills, slitters, and a wide variety of heavy machinery. Bearing wear is said to be minimized by oversize bearings. Rivet heads can't score the discs, which are bolted in place, instead of floating in teeth or splines. Linings are automatically withdrawn from contact with discs, eliminating drag.

It's impossible for both clutch and brake to be engaged simultaneously. Other safety features include immediate stop and compressed air escape when compressed air or current fail.

Power Presses, Inc., Penton Bldg., Cleveland 13, Ohio.

More on next page

THOMAS
Flexible ALL METAL COUPLINGS
FOR POWER TRANSMISSION
REQUIRE NO MAINTENANCE

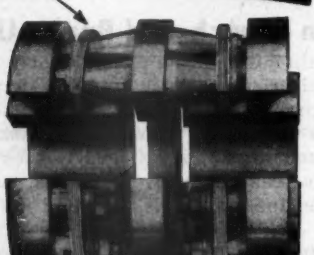
Patented Flexible Disc Rings of special steel transmit the power and provide for misalignment and end float.

Thomas Couplings have a wide range of speeds, horsepower and shaft sizes:
½ to 40,000 HP
1 to 30,000 RPM

Specialists on Couplings for more than 30 years

BACKLASH FRICTION WEAR and CROSS-PULL are eliminated
Lubrication is not required!

PATENTED FLEXIBLE DISCS



THE THOMAS PRINCIPLE GUARANTEES PERFECT BALANCE UNDER ALL CONDITIONS OF MISALIGNMENT.

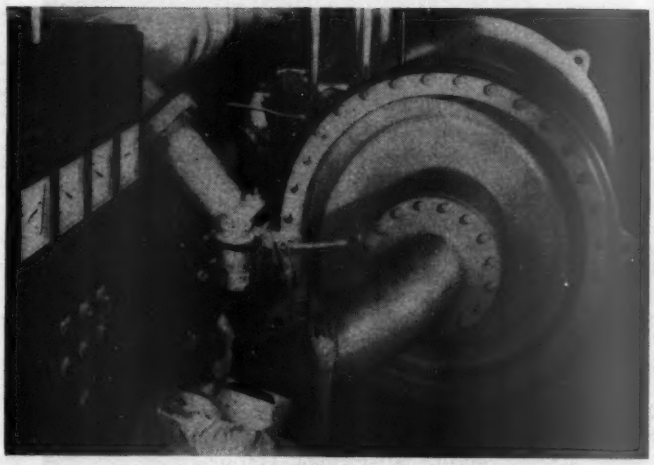
NO MAINTENANCE PROBLEMS.

ALL PARTS ARE SOLIDLY BOLTED TOGETHER.

Write for the latest reprint of our Engineering Catalog.

THOMAS FLEXIBLE COUPLING CO.
WARREN PENNSYLVANIA

AIR CONDITIONING



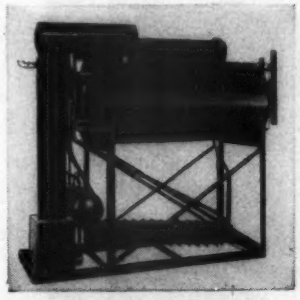
Centrifugal Refrigeration Unit

Centrifugal refrigeration units, recognized as efficient water chillers for large comfort and process installations are now available for smaller air conditioning units. Five new CenTraVac models cover a capacity range of 45 to 190 tons.

CenTraVac is a complete water chilling system. You get condenser, evaporator, and hermetically sealed centrifugal compressor and motor in one package. Freon 113 is the refrigerant.

Horsepower per ton of refrigeration is less than 1-to-1. Capacity control automatically responds to load variations down to 10% of rated capacity. Forced feed lubrication and the elimination of shaft seals minimize maintenance requirements. Operation is said to be vibration free—you need no special foundation other than that required to support unit's dead weight.

The Trane Co., LaCrosse, Wis.



Steam-Powered Refrigeration Unit

Simplicity of operation and control highlight this 20-ton water chiller. The unit comes as a hermetically sealed refrigeration package. There are no electrical connections or moving parts.

The Model DUT works on the absorption refrigeration principle. Water absorbed in a lithium bromide solution is the refrigerant. Steam at atmospheric pressure supplies the energy required. You can use your low pressure exhaust steam to do the job. You'll also need a supply of condensing water.

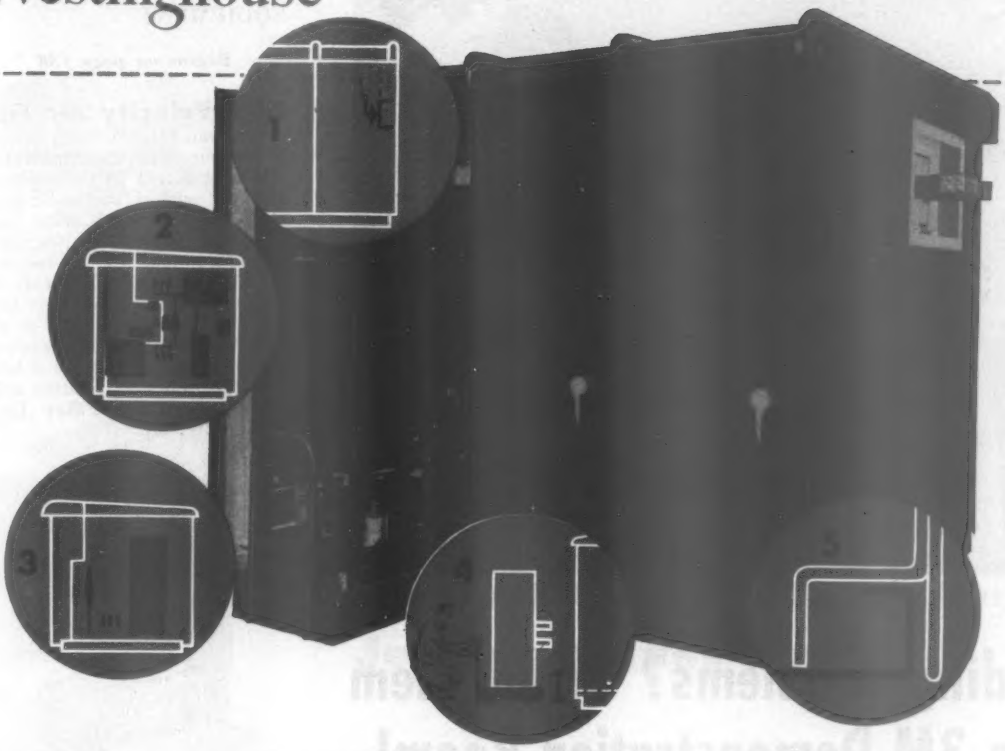
Unit is designed for localized comfort or process air conditioning. With 85 degrees F. condenser water and 350,000 Btu./hr. steam input, the unit can produce from 42 to 70 gpm. of chilled water at 45 degrees F.

Air Conditioning Div., Servel, Inc., Evansville 20, Ind.

More on next page

YOU CAN BE **SURE**.. IF IT'S

Westinghouse



Westinghouse Outdoor Switchgear gives you 5 NEW OPERATING ADVANTAGES

Westinghouse brings you redesigned 5-Kv Outdoor Metal-Clad Switchgear with improvements that add up to time and cost savings in installation, operation and maintenance.

Greater accessibility of operating parts . . . better ventilation and weatherproofing . . . improved appearance are among its advantages that give you more for your switchgear dollar.

1. Control knife switches are in easy-to-reach position.
2. Auxiliary compartments provide better equipment access. More headroom makes inspection and maintenance easier.
3. Enclosure makes possible use of two potheads for two 3-conductor cables without sacrificing the full-length instrument panel. Adequate clearance is afforded behind the panel at the pothead elevation for semi-flush Flexitest cases and average-depth Type W switches.
4. Platform height is adjustable. Transport truck provides adjustability for slight variations in pad level.
5. Newly designed doors with flanged edges provide extra rigidity and improved weather seal.

Get complete facts from your nearby Westinghouse representative, or write Westinghouse Electric Corporation, P. O. Box 868, Pittsburgh 30, Pennsylvania.

* * *

See "Electrical Proving Ground" . . . the dramatic story of the Westinghouse High Power Laboratory in sound and color motion picture. For details, write Westinghouse Film Division, Box 868, Pittsburgh 30, Pennsylvania. J-60743

Westinghouse

METAL-CLAD SWITCHGEAR

ABRASIVE EXPERT helps customers at one of the new 3M Demonstration Rooms.

Grinding problems? Bring them to a 3M Demonstration Room!

Grinding costs too high, production too slow? You can get fast, *expert* help at the nearest 3M Demonstration Room, staffed with 3M Methods Engineers.

Skilled operators will grind samples from your production line, work out new methods and recommend the type of coated abrasive that's best, most economical for the particular job.

Come in anytime with any kind of problem—from heavy grinding to fine finishing. Chances are we can assist you. 3M Demonstration Rooms: Boston, Chicago, Cincinnati, Cleveland, Detroit, Grand Rapids, Los Angeles, New York, Philadelphia, St. Louis, St. Paul, San Francisco, and Seattle. Send the coupon below for further information.

Minnesota Mining & Mfg. Co., Dept. F351
St. Paul 6, Minn.

☐ Please have a 3M Methods Engineer call.

☐ Please send copy of new "Step Up Production" booklet explaining the 3M Method of Grinding and Finishing.

3M ABRASIVE BELTS

Name.....

Firm.....

Address.....

City.....Zone.....State.....

Made in U.S.A. by MINNESOTA MINING & MFG. CO., St. Paul 6, Minn., also makers of "Scotch" Brand Pressure-sensitive Tapes, "Sctoch" Sound Recording Tape, "Underseal" Rubberized Coating, "Scotchlite" Reflective Sheeting, "Safety-Walk" Non-Slip Surfacing, "3M" Adhesives. General Export: Durex Abrasives Corp., New Rochelle, N. Y. In Canada: Canadian Durex Abrasives Ltd., Brantford, Ontario.

AIR CONDITIONING EQUIPMENT

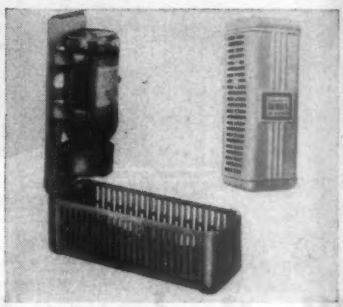
Begins on page 138

High Velocity Air Filter

You can filter air at velocities up to 500 fpm. with the American Type HV unit filter. Filter consists of a frame packed with corrugated strips of fine mesh wire.

Maker claims uniformly high efficiency over a wide range of air velocities. You can clean the filters the conventional way in washing and charging tanks—or you can recondition them by washing out accumulated dust with a hose and then spraying with filter adhesive.

American Air Filter Co., Inc., Louisville, Ky.



Indoor Air Freshener

Chlorafal, an air freshener and deodorizer, comes in a compact wall-mounting dispenser. The liquid solution slowly vaporizes to neutralize offensive odors. Combats odors from waste material, dampness, decay, etc. Maker claims dispenser uses only a minimum of solution.

Hysan Products Co., 932 W. 38th Pl., Chicago.

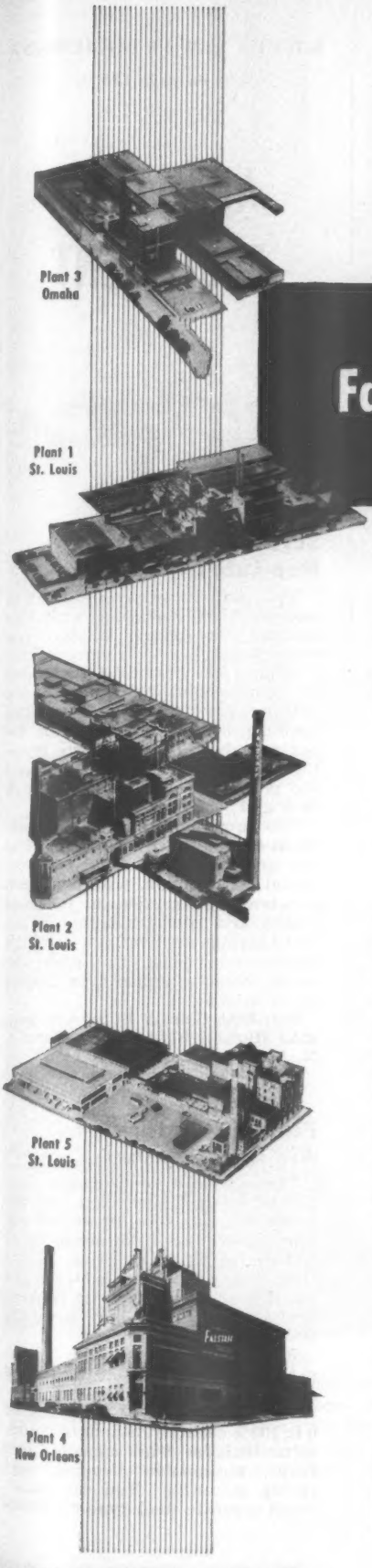
Refrigerant Compressors

The Trane people claim vibration-free operation and long-wearing surfaces for their latest reciprocating compressors. Units have been designed for air conditioning applications in 10, 15, 20, 25, 40, and 50 ton capacities. Design refrigerant is Freon F-12. Complete condensing units are available.

Cylindrical body design, V and W arrangements of 4-, 6-, and 8-, cylinder models, and complete static and dynamic balancing are said to promote smooth operation. Noise level is below that of the average office. Pistons and connecting rods are aluminum. Compressor starts unloaded, permitting direct drive by constant speed motor.

The Trane Co., LaCrosse, Wis.

More on next page



At all five great plants of . . .

Falstaff Brewing Corporation...

as in buildings that set the pace in every industry . . . you'll find

Jenkins Valves

In the brewing of Premium Quality Falstaff, Yesterday and Tomorrow meet. At five great plants — in St. Louis, Omaha, and New Orleans — Falstaff Brewing Corporation combines ancient brewing skills with the most modern brewing methods.

To produce, and maintain, the same "premium quality flavor" in different breweries is no small accomplishment. Falstaff employs not only the latest in scientific knowledge but, for absolute uniformity of product, the most dependable equipment modern engineering can devise. That is why Jenkins Valves are on the pipelines in all five Falstaff plants.

Modern brewery, super-airport, or skyscraper — wherever unfaltering efficiency and long service life are "musts" in operating equipment, you'll find Jenkins Valves. They have been the choice, consistently, of leading architects, engineers and contractors for the buildings which are shaping America's skyline of Tomorrow.

For Jenkins builds extra endurance into valves — proved by low upkeep cost records in every type of service. Yet, despite this extra value, *you pay no more* for Jenkins Valves.

For new installations, for all replacements, let the Jenkins Diamond be your guide to lasting valve economy. Jenkins Bros., 100 Park Ave., New York 17; Jenkins Bros., Ltd., Montreal.

Sold through leading Distributors everywhere

JENKINS
LOOK FOR THE DIAMOND MARK
VALVES
SINCE 1864 TRADE JENKINS MARK

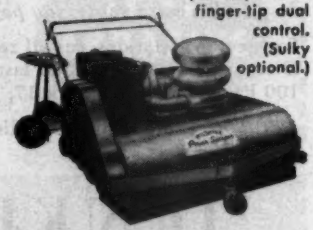
Jenkins Bros

MODEL 1000
Super Heavy Duty with forward and reverse drive, 100% visibility.

CUTS *Your* SWEEPING COSTS 75%

Let's face it! The hand sweeper can be a grim reaper of your profits... as it has been in hundreds of large and small plants. Their answer?... "The Wilshire Power Sweeper!" It's doubly efficient because its two-way brush and vacuum action picks up everything from cigarette butts to pop bottles in one easy operation. It's doubly economical, too, because one man does the work of a cleanup crew. Make us prove how much the Wilshire Power Sweeper can cut your sweeping costs with a free demonstration on *your* job. Write for full information and dealer nearest you.

MODEL 800
America's favorite Heavy Duty Sweeper with finger-tip dual control. (Sulky optional.)



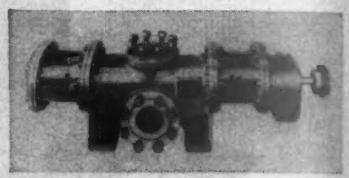
FACTORY TESTED... 90-DAY GUARANTEE

For dealer nearest you write Dept. H-3

Wilshire
POWER SWEEPER CO.
526 W. Chevy Chase Drive
Glendale 4, Calif.

Begins on page 136

AUXILIARY EQUIPMENT



Screw Pump for Non-Lubricating Liquids

You can move nonlubricating liquids of any viscosity with this positive displacement bracket-type screw pump. Capacity ranges from 1 to 700 gpm. Servicing is speeded by single-point alignment — the housings for bearings and external timing gears are integral with the pump body. All these parts move together with the pump body and are positioned as a unit by shoulders and locknuts.

The pump can be direct-connected at speeds up to 1800 rpm. You can get them in vertical or horizontal construction, with corrosion resistant alloys. Steam jacketed bodies and special stuffing boxes and bearings are available for high temperature work. For high viscosity liquids, hopper-type bodies are available.

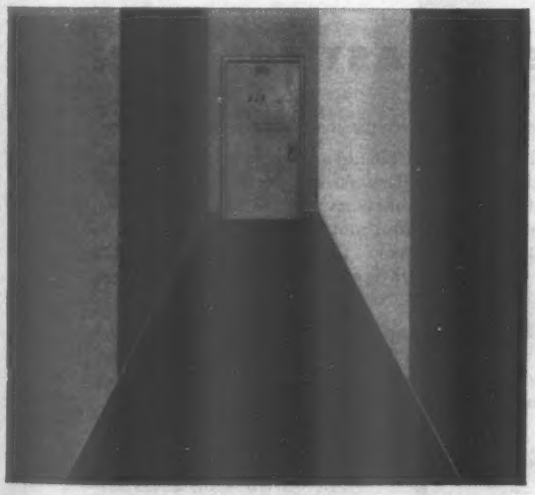
Sier-Bath Gear & Pump Co., Inc., 9252 Hudson Blvd., North Bergen, N. J.

Portable Rotary Air Compressor

The two-stage rotating-vane compressor on this 4-wheeled unit delivers 600 cfm. free air at 100 psi. The compressor is diesel-powered and cooled by oil injection. Maker claims discharge temperatures are 100 degrees F. lower than conventional portables. Weight ready for use is 9500 lb.

Rotary-type compressor eliminates pistons, rods, valves, and clutch. Automatic regulator controls compressor over full range of 0 to 100% capacity. Standard equipment includes 8-hr. capacity fuel tanks, automotive steering, and spring mounting. You can easily reach separate stack-type air filters

Modern use of paint colors gives the above open-plan office a distinctive, pleasant atmosphere that is a far cry from the "bull pen" effect of old-time open areas. This plan frees the area to light and air, greatly increases the feeling of spaciousness, facilitates work flow.



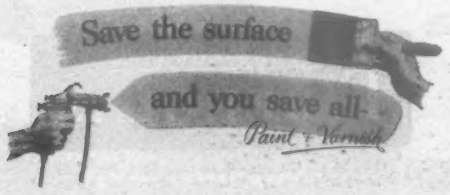
Narrow corridor walls apparently can be "moved apart" by painting each side in contrasting tones. Divide the walls with contrasting colors—a light color on one end, and a darker color on the other end. Reverse the colors on the opposite wall. This same treatment also will make long, narrow offices appear wider.

How to "move" walls with a paint brush!

Does your office space seem crowded and there's literally no more room available?

Imaginative use of paint colors—plus modern, "open-plan" office arrangements—can make crowded corridors, rooms and offices feel spacious and efficient, give you more pleasant work centers.

Illustrated are just two of hundreds of examples that prove paint has *power* to seemingly move walls, and thereby to create happier living and working conditions, and at the lowest cost of any remodeling factor. And the investment pays dividends in protection, too, for—*it always costs more NOT to paint!*



© 1951. National Paint, Varnish and Lacquer Association, Inc., Washington, D. C.

Under Glass... THEY'D LAST FOREVER!

If you could pack your electrical apparatus in glass, there's no telling how long it would last!

But it's service use that pays off in profits, so a prominent locomotive maker chose the next best use for the protective qualities of glass—or, more specifically, insulating materials made with Fiberglas* yarns.

Here's how he does it:

Electric traction motors that directly drive the wheels on diesel-electric engines, normally have a usable life of only 600,000 road miles. Armatures and coils insulated with organic materials break down under service use, causing costly down-time.

The solution: Coil and armature insulation made with Fiberglas glass-base materials and silicones which permit higher currents, resist heat far longer. The result: traction motor ratings increased from 700 to 835 amperes . . . braking effort upped 23% . . . locomotive rating upped 25% . . . and, most important of all, *road-mile life increased 8 times!*

This is just one example of product improvement made with Fiberglas glass-base insulations. If you make or use electrical apparatus, it will pay you to specify Fiberglas insulating materials.

OWENS-CORNING FIBERGLAS CORPORATION, ELECTRICAL SALES DIVISION, 16 East 56th Street, New York 22, N. Y.

OWENS-CORNING FIBERGLAS

FIBERGLAS IS IN YOUR LIFE... FOR GOOD!

*Fiberglas is the trade-mark (Reg. U. S. Pat. Off.) of Owens-Corning Fiberglas Corporation for a variety of products made of or with glass fibers.

on both engine and compressor for servicing on dusty jobs. You can get descriptive Bulletin No. 2310 by writing direct to the manufacturer.

Ingersoll-Rand Co., 11 Broadway, New York 4.

Arc Welder for Field Maintenance

A 300-amp. arc welder, for field maintenance work, is powered by a self-contained self-starting gasoline engine. The unit also contains a 3 kw. auxiliary power generator for lights and electric tools. Hinged doors in the sheetmetal enclosure provide access to control panels and working parts.

The welding generator rated at 300 amp. under one hour resistance load has a current range of 50 to 400 amps. A squirrel-cage fan cools the unit.

Hobart Bros. Co., Hobart Sq., Troy, Ohio.

Air-Powered Transfer Pump

Speed-Flo can empty a 55-gallon drum of SAE 30 oil in slightly over 2 minutes, its makers claim. You can use this air-operated pump to transfer lubricants, thinners, and noncorrosive chemicals at rates up to 22 gallons per minute. The Model 82230 fits any 2-in. opening drums.

The steel pump weighs 18 pounds. A disc-type regulator provides fingertip control of output volume. Maker's bulletin No. 213 tells the complete story.

Lincoln Engineering Co., 5731 Natural Bridge Ave., St. Louis 20, Missouri.

Low-Pressure Multi-Purpose Pump

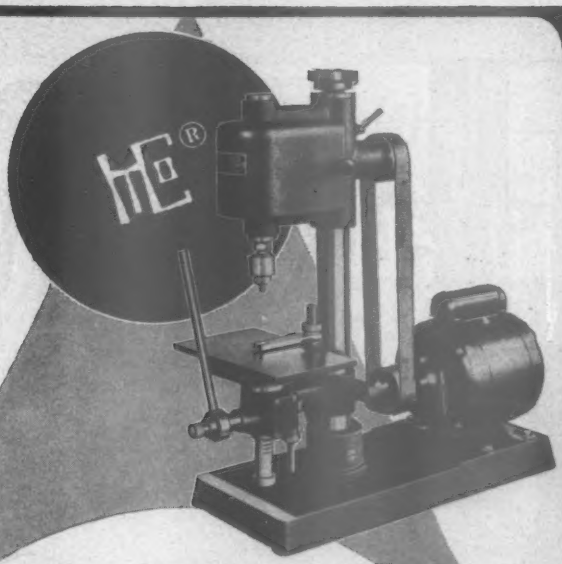
Where you're circulating small quantities of water or soluble oils against a low head, the Taco multi-purpose pump will do the job. It can handle 10 gpm. against a 3-ft. head.

Unit is powered by a 1/25-hp. motor—requires no seals or lubrication. Body, bracket, and impeller are bronze—shaft is stainless steel. Intake has a screen filter. Inlet plate below water line has 1-in. hole—outlet is ¾-in. NPT.

Taco Heaters, Inc., 137 South St., Providence 3, R. I.

More on next page

Steel
Brass
Paper
Monel
Bronze
Plastic
Ceramic
Cast Iron
Aluminum
Stainless Steel



Hamilton, Super-Sensitive, Precision, Small Hole Tapping Machine.

No Matter What Material You Work

If you have small, precision holes to drill or tap; and if this work must be done on fast production schedules; and if you can afford *only* a minimum of work spoilage and practically *no* breakage of taps or drills, then, sir, **you need a super-sensitive, precision, small hole drilling or tapping machine of Hamilton manufacture.** And you can get complete specifications and prices on the Hamilton line of four drills and a tapper from the bulletins which we have had printed especially to convey this information. They are free! Write for them today! You can use the information contained in these bulletins . . .

No Matter What Material You Work

Stainless Steel
Aluminum
Cast Iron
Ceramic
Plastic
Bronze
Monel
Paper
Brass
Steel

Maxi-Jr., Super-Sensitive, Precision, Small Hole Drilling Machine.

THE *Hamilton* TOOL COMPANY
906 HANOVER STREET • HAMILTON • OHIO • U • S • A

OF COURSE, YOU'RE RIGHT!

You *can* increase production.

You *can* improve product quality.

You *can* increase your steam plant efficiency and at the same time reduce your fuel bills. And *all* without major expenditure.

We tell you how in a free booklet containing questions which have an important bearing on your production cost and output.

Fill in the Coupon, or ask for No. 60

Sarco Company, Inc.
Empire State Building
New York 1, N. Y.

YES, send me without obligation your bulletin No. 60. I understand it has practical suggestions of how I can save on operating cost.

NAME.....
COMPANY.....
STREET & NO.....
CITY & STATE.....

WHAT'S NEW IN EQUIPMENT
Begins on page 136

ELECTRICAL EQUIPMENT

Sealed Transformers With Class B Insulation

GE engineers have found that Class B insulation in a nitrogen atmosphere can be operated safely at temperatures previously assigned to Class H materials. By using Class B insulation the company offers a considerable saving to users of its new sealed dry-type transformer.

The nitrogen-filled transformers come in ratings through 1500 kva and 15,000 volts. You can install them indoors or outdoors—even underground in moisture, dust, or fume-laden atmospheres. The absence of tubes and radiators is said to simplify installation, facilitate tank painting, and eliminate liquid testing and maintenance.

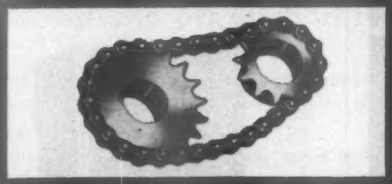
General Electric Co., Schenectady 5, N. Y.

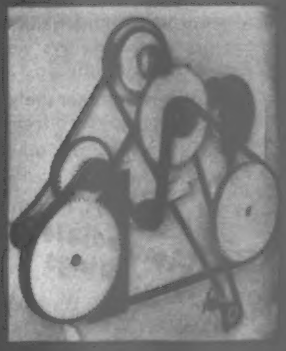
Variable Speed Induction Motor

Speed is continuously variable on the Schrage induction motor—from 600 to 1800 rpm. on one standard model, from 0 to 2400 on another. You change speed by manually adjusting the relative position of the brushes for the stator and rotor regulator windings.

The motor is designed for constant torque-adjustable speed applications. It delivers rated torque down to 750 rpm. Below this speed

Harness Your Horsepower with
DIAMOND ROLLER CHAINS





Replacing their tool check system paid a big return in Precision Castings Company's die shop in Syracuse, N. Y., proving again that . . .

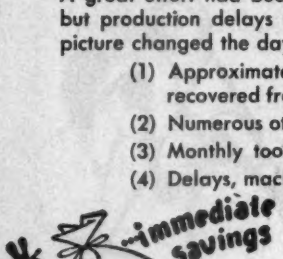
SMALL SHOPS, TOO, NEED BETTER CONTROL OF TOOLS

"I would use McCaskey Tool Control if I had only 20 men drawing tools."

Mr. Edward Burtt, Precision's Stores Foreman, makes this statement without qualification because of the results he saw from their switch to McCaskey.

A great effort had been made to control tools with their check system, but production delays were frequent and tool expense was high. The picture changed the day McCaskey operation started:

(1) Approximately $2500 worth of end mills alone were recovered from machines, tool boxes and benches.
(2) Numerous other tools also were found.
(3) Monthly tool purchases dropped immediately.
(4) Delays, machine down-time and idle time of operators caused by missing tools were eliminated. They know now what tools they have and where they are.
(5) Crib inventory was reduced through knowing monthly activity of each item.
(6) Tool breakage is being cut by quickly identifying sources of trouble and correcting them.
(7) Crib service is much faster with no increase in personnel.



Let us tell you how similar savings in tools and time can be made in your shop. Mail coupon today for pamphlets giving you all the facts.

THE McCASKEY REGISTER CO.
ALLIANCE, OHIO
Send me the facts on McCaskey Tool Crib Control.
Name .....
Position .....
Company .....
Address .....
FMM—3-51

McCaskey
INDUSTRIAL CONTROLS
PRODUCTION • INVENTORY • TOOLS • COSTS • PAYROLL

torque decreases linearly with speed. You can start the motor across the line with brushes set in the minimum speed position. Power factor is close to one. Available in 1½- to 15-hp. ratings, 220/440 volts, 60 cycles. Normal or forced ventilation models.

Belgian Electric Sales Corp., 1 E. 53rd St., New York 22.

Selenium Rectifier D.C. Power Supply

New metal-enclosed d.c. power supplies, for indoor installation, use selenium rectifier stacks. Units supply either 125 or 250 volts d.c. from a 208-, 230-, or 460-volt, 3-phase, 60-cycle input. You can get convection-cooled units up to 5 kw., fan-cooled models up to 25 kw.

A metal case mounts one to four individual rectifiers. Controls include built-in contactors with thermal overload protection, and fused disconnect switches. Efficiencies run as high as 84% with a power factor of 95, says maker. Company bulletin on request.

General Electric Co., Schenectady 5, N. Y.

Low-Voltage A.C. Power Regulating Unit

With an Industrol power pack, you can bring high-voltage power into the load area with substantial savings in cable. Then step the voltage down to the required value and maintain it at that level for efficient operation of rated plant equipment.

Inductrol load centers house an air circuit breaker, a dry-type transformer, and an air-cooled induction regulator in one steel cabinet. The compact power pack can be installed anywhere indoors without fireproof vaults—overhead if necessary to save floor space.

You can get Inductrols in single- or three-phase ratings. With power input at 480 or 600 volts, 60 cycles, the regulated output is 120/240 or 280Y/120. Capacity ranges from 15

Farval pays for itself quickly, many times over

...saving oiling labor
...saving lubricant
...saving bearing expense
...saving production time

WITH Farval you lubricate your machinery or equipment mechanically. Farval does the job quickly and dependably.

Any type of bearing surface, enclosed or open, can be Farval-lubricated with grease or oil. Measured charges of lubricant are metered to each bearing through the unique Dualine Valve, delivered under pressure from a central reservoir, either by a manually operated pump or one actuated by an automatic time-clock mechanism.

Farval is not a new idea. It has proved its value in service over a 23-year period, protecting millions of bearings in every phase of industry—in manufacturing plants, mining and quarrying operations, transportation—wherever there are bearings that have to be lubricated. Thousands of installations on mills, presses, conveyors, cranes, engines and other industrial equipment provide records of money saved. Savings take four forms:

1. Labor saving—Farval eliminates hand oilers. Minimum attention only is required—to inspect system, refill lubricant reservoirs, etc.

2. Lubricant saving—Correct amounts are used without waste, frequently reducing oil or grease consumption as much as 75%.

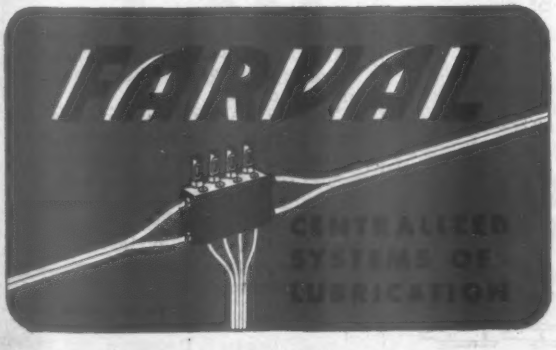
3. Bearing expense saving—No more burned out or damaged bearings with Farval protection. Expense of replacement eliminated.

4. Production time saving—Farval lubricates while equipment is running. No shutting down to oil. No taking a machine out of production to repair or replace bearings.

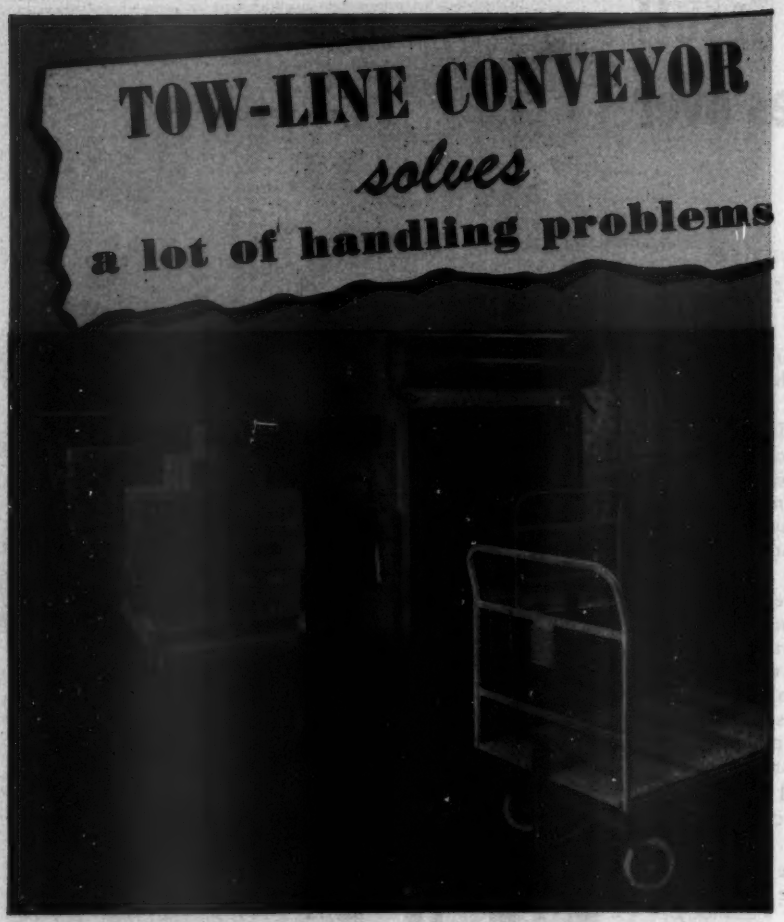
In short, savings are so positive that you soon recover the entire cost of a Farval system—and savings continue as extra dividends.

If you want figures on savings possible with Farval on the types of machines you operate, just write us. Tell us what equipment you have and ask for Bulletin 25. The Farval Corporation, 3256 East 80th Street, Cleveland 4, Ohio.

Affiliate of The Cleveland Worm & Gear Company, Industrial Worm Gearing. In Canada: Peacock Brothers Limited.



FARVAL—*Studies in Centralized Lubrication*
No. 122



If you want to clear up confusion and assure an orderly flow of traffic in your plant, in your warehouse, in your order make-up, receiving or shipping departments, consider the possibilities of a MHS Tow Line Conveyor. The flexibility of this conveyor makes it adaptable and economical for practically any set of requirements.

The sub-floor tow line conveyor gives you a completely unobstructed floor area with no overhead structures. Dollies or trucks may be engaged or disengaged at any point along its path for loading or unloading.

If it is impracticable to install the sub-floor track, you may tow trucks or dollies from an overhead MHS Monoveyor. Both the sub-floor and the overhead systems can be operated on one or more levels.

For a full description of the tow line conveyor and all its possibilities write for a copy of Bulletin TC-1.

Mechanical Handling Systems, Inc.
4608 NANCY AVE. • DETROIT 12, MICH.
Offices in Principal Cities

to 100 kkva. Maker will supply Bulletins GEA-5571 on request.

General Electric Co., Schenectady 5, N. Y.

Load Centers

Thermal-magnetic breakers in sizes from 15 to 50 amp. are physically interchangeable in Trumbullite load centers. Centers come in 6 models for 1 to 20 circuits.

Busbars in the 12 through 20 circuit load centers are mounted in a plastisol material. This interior is acid- and alkali-resistant—it won't age or shrink. Busbars are said to run 10% cooler than in open air. You can sequence phase the breakers—that is, wire adjacent breakers to alternate phases to balance loads. Maker will send you bulletin TEB-12.

Trumbull Electric Mfg. Co., Plainville, Conn.

Voltage Regulators

A line of induction voltage regulators is designed to meet the demand for 3-phase regulated power at low voltages. Ratings range from 120 to 600 volts, 12 to 85 kva.

Both self-cooled and forced-air-cooled regulators come in standard 10% and 20% (raise and lower) ranges of regulation. Use of a 3-phase winding on a single core, maker claims, provides considerable saving over previous line that had 3 single-phase regulators

General Electric Co., Schenectady, 5, N. Y.

Low Capacity Spot Welding Control

For spot-type resistance welders of low capacity, Westinghouse has a new line of synchronous and nonsynchronous controls. Air-cooled tyratron tubes make and break the welding current. There are no moving parts.

The NEMA type 1 enclosures can be mounted on or near the welding machine. Knockouts facilitate external connection. Available in synchronous ratings up to 50 amp., nonsynchronous ratings up to 100 amp. at 10% duty cycle.

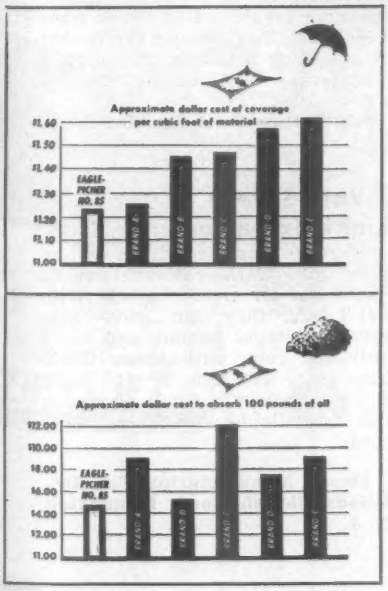
Westinghouse Eectric Corp., Box 2099, Pittsburgh 30.

More on next page

An ounce of prevention

EAGLE-PICHER INDUSTRIAL FLOOR DRY NO. 85

is worth a pound of cure



Eagle-Picher Industrial Floor Dry No. 85 is tops for efficiency and economy!

Eagle-Picher's remarkable new Industrial Floor Dry No. 85 is a granular mineral compound having tremendously high absorptive properties for oil, grease, kerosene, water and other liquids. Chemically inert, and non-combustible, it is insoluble in such liquids. Its light weight provides highest possible floor coverage, and it may be easily applied by hand, shovel or mechanically. It retains its granular form even when saturated with liquids, and retains its effectiveness for *longer* periods. Examine the results of comparative tests of Eagle-Picher Floor Dry against five other leading compounds. Or better yet, try it in your own plant—you'll get more for each dollar spent!

THE EAGLE-PICHER COMPANY
Dept. FM-3-51, Cincinnati (1), Ohio

Gentlemen: Please send me more information about Eagle-Picher Industrial Floor Dry No. 85.

*Name*_____

*Address*_____

*City*_____ *Zone*____ *State*_____

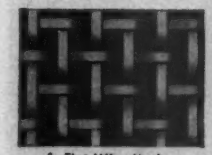
The Eagle-Picher Company

Since 1843

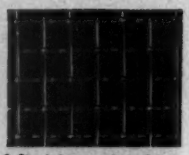
GENERAL OFFICES: CINCINNATI (1), OHIO

EAGLE EP PICHER

9 REASONS for specifying *Cambridge* Industrial Wire Cloth

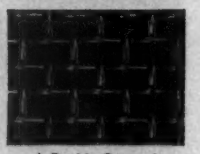


1. Flat Wire Mesh



2. Single Intermediate Crimp

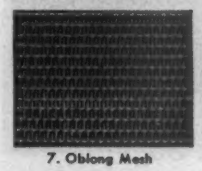
3. Double Intermediate Crimp



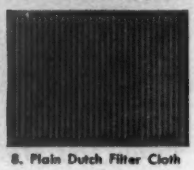
4. Double Crimped

5. Twilled Weave

6. Calendered Backing Screen



7. Oblong Mesh



8. Plain Dutch Filter Cloth

9. Twilled Dutch Filter Cloth

● **SELECT THE WIRE CLOTH** that meets your requirements best from these 9 basic Cambridge weaves. Each is available to you in any metal or alloy wire of any gauge. Mesh sizes range from 4" openings to 20 x 250 mesh, according to your needs. *Many types of Cambridge wire cloth are ready for immediate shipment.*

Close attention to each loom by individual operators during weaving is your assurance of exact mesh count. Each finished piece is carefully inspected before shipment to make certain it is free from defects.

TELL US your special problem in filtration, screening or sizing. Perhaps our facilities and experience can be combined to produce the special type of wire cloth needed.

FREE WIRE CLOTH HANDBOOK! 73 pages of specifications, metallurgical data and descriptions of industrial wire cloth. WRITE TODAY for your copy of this valuable reference book.

The Cambridge Wire Cloth Co.

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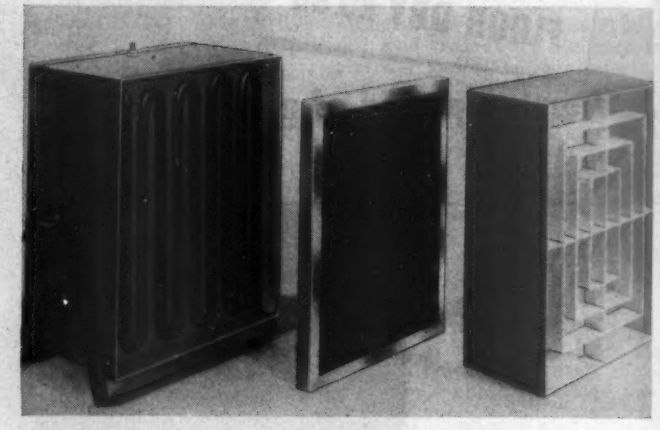
WIRE CLOTH | METAL CONVEYOR BELTS | SPECIAL METAL FABRICATIONS

OFFICES IN PRINCIPAL INDUSTRIAL CITIES

See "Wire Cloth" in your Classified Telephone Directory.

LIGHTING EQUIPMENT

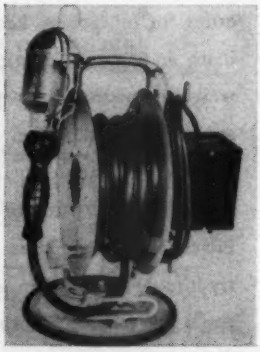


Cold Cathode Ultra-violet Lamp

The heat's off ultra-violet inspection lamps. Using a cold cathode, the Blacklite fluorescent lamp operates at slightly more than body temperature. The 160-watt unit provides black light for such jobs as magnetic particle inspection, detection of surface flaws, fluorochemical analysis. Effective range is 20 feet.

The cold cathode also means added life expectancy. Maker claims 10,000 burning hours or more regardless of the number of starts. The light is instant starting. You can use the double trunnions as handles, legs, or mounting brackets. Filter glass and adjustable diffuser are optional. Unit weighs 16½ lb. Operates on 110-125 volts a.c.

Scientific Instrument, Inc., Box 92 Homecrest Sta., Brooklyn.



6-Volt Safety Light Extension

Workers carrying light extensions into wet locations have to watch out for electric shock. With Saf-T-Lite, they can leave dangerous voltages behind, and carry only six volts with them. Saf-T-Lite steps 440, 220, or 110 volts down to power a 6-volt extension light. Available with 50- or 100-ft. cords.

Etraco Manufacturing Co., Inc., Woods Church Road, Flemington, N. J.

Two-Way Emergency Light

Preparing for Civil Defense emergencies. A new portable lamp provides 80 hours of continuous light on each battery charge. A second filament in the bulb will give 20 consecutive hours of high-power floodlighting. A toggle switch controls both filaments.

Carpenter Mfg. Co., Somerville, Mass.

More on next page

Free your hands with a ZIP!

HANDLE IT "THRU-THE-AIR"—FASTER—FOR LESS

Skilled hands shouldn't be load-lifters. There's more important work for them to do — more profitably!

Take the hands out of handling — make your man-hours more productive by using Zip-Lifts wherever loads must be handled frequently — along assembly lines, beside machine tools, etc. Make it a push button job.

There's nothing like the Zip-Lift for all-round service and quality — America's favorite wire rope electric hoist.

You pay so little more for ADDED VALUES like these—

SAFER — Full magnetic control with current reduced to 110 volts at push button. Plugging crane type limit switch. Large double brakes. P&H has never stretched a motor rating. That's *your* protection.

LIFETIME CONSTRUCTION — Precision built — shaved gears run in oil — grease-sealed bearings — fully enclosed.

SEE YOUR ZIP-LIFT DEALER, or write us for Bulletin H-20 — It's filled with time-saving ideas for you.

P&H ELECTRIC HOISTS
4525 W. National Avenue
Milwaukee 14, Wisconsin

HARNISCHFEGER CORPORATION

EXCAVATORS • OVERHEAD CRANES • HOISTS • ARC WELDERS & ELECTRODES • SOIL STABILIZERS • CRAWLER & TRUCK CRANES • DIESEL ENGINES • CANE LOADERS • PRE-ASSEMBLED HOMES

Be sure you get the

RIGHT ONE!

WHETHER your problem is handling rolls or cartons, bags or crates, be sure you pick a battery-electric truck to give you the utmost in dependability and dollar value. Battery trucks are an outstanding investment. They use smooth-starting electric drives; need no warm-ups or tune-ups; use no inflammable fuel; run with a minimum of down-time; use no power during stops. That's why they can't be beat for top-notch performance at rock-bottom cost.

★

Picking the right battery for your truck is equally important. Edison batteries are *really* dependable because of their rugged construction: their cells are built of steel inside and out, and their electrolyte preserves steel. They are not injured by accidental short-circuiting or reverse charging . . . or freezing . . . or laying up without attention. Users will tell you that Edison batteries take jars, jolts and accidents as part of the day's routine . . . and pay for their keep in short order because they stay *on the job, out of the repair shop!*

WRITE TODAY for free booklet SB 2039 and a current price quotation. You'll find Edisons cost little more than other makes of batteries . . . and they pay this back over and over in terms of low upkeep and long, long life.—*Edison Storage Battery Division of Thomas A. Edison, Incorporated, West Orange, New Jersey. In Canada, International Equipment Company, Ltd., Montreal and Toronto.*

EDISON

Nickel · Iron · Alkaline

STORAGE BATTERIES

Typical Truck Battery

LUBRICATION EQUIPMENT

Lubrication Service Cart

You can maneuver this two-wheeled grease rig along plant aisles and between closely-spaced machines. The Lube Service Cart is a self-contained unit (requiring no air supply) equipped for either high pressure or volume greasing. It carries an oil pump, too.

Grease and oil are dispensed through 10-ft. hose. Two models are available. All equipment on the rig is removable, can be moved to locations inaccessible to the cart.

Gray Co., Inc., 22 Graco Sq., Minneapolis 13, Minn.

Oil-Fog Lubrication

Here's another entry into the field of atomized lubrication (FACTORY, Nov. '50, p. 140). Norgren's Micro-Fog lubricator breaks oil down to particles 2 microns or less in diameter, then moves the microscopic particles in a stream of air to lubrication points.

The relatively dry lubricating mist, capable of suspension over long distances, becomes wet only at the final point of application. It won't flood lines or equipment. Advantages claimed by maker are fully automatic operation, more thorough lubrication than conventional methods, precision control of air flow, and minimum air requirements. Oil can be metered as closely as one drop in 20 minutes.

C. A. Norgren Co., 222 Santa Fe Dr., Denver 9, Colo.

More on next page

C ONSERVATION
M AINTENANCE
P LAN
by
QUAKER

HOW TO GET More Production . . . Less Maintenance

QUAKER'S COMPLETE PLAN FOR LONGER PRODUCTIVE LIFE FROM INDUSTRIAL RUBBER PRODUCTS

Now, to meet the need to produce more with less, put the QUAKER Conservation Maintenance Plan to work in your plant.

Developed by Quaker Engineers to help you get more production out of your industrial rubber products, with less maintenance, this plan is practical and easily applied by any man in your plant.

Quaker C M P includes a big factual booklet on how to make conveyor and transmission belting, hose, packings and moulded products last longer. Charts are available for shop bulletin boards. Technical bulletins will be issued periodically to you with the latest conservation and maintenance data. It's a complete plan that will help every man in your plant to conserve . . . will reduce maintenance . . . and increase production.

Whether it's the conveyor system, the main power drive, or the air hose in your plant, the QUAKER Conservation Maintenance Plan will help you save time, material and money. Put this practical plan to work immediately! Write today for full details.

GET YOUR COPY

of this big factual booklet and other helpful data of the QUAKER C M P program. No charge, no obligation. Yours to help you get more out of industrial rubber products.

QUAKER RUBBER CORPORATION
DIVISION OF H. K. PORTER COMPANY, INC.
PHILADELPHIA 24, PENNA. BRANCHES IN PRINCIPAL CITIES

The Latest Heat Treating Information

MODERN PROCESSES
STANDARD AND SPECIAL
FURNACES

FOR FREE LITERATURE...

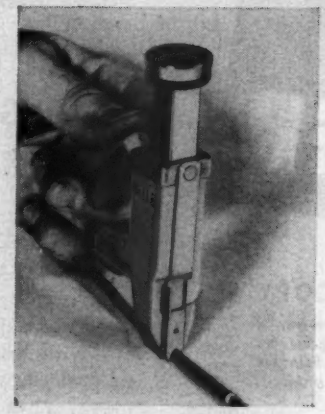
CHECK SUBJECT OF INTEREST... ATTACH TO YOUR LETTERHEAD

Gas Carburizing
Carbon Restoration
Homogeneous Carburization
Suspended Carburization
Dry (Gas) Cyaniding
Clean and Bright Atmosphere Hardening
Bright Gas Normalizing and Annealing
Bright Super-Fast Gas Quenching
Atmosphere Malleableizing
Atmosphere Heating For Forging
High Speed Heating

Also available literature on furnaces and burner equipment for all standard heat treating processes.

SURFACE COMBUSTION CORPORATION
TOLEDO 1, OHIO

MAINTENANCE TOOLS & SUPPLIES



Pocket-Size Automatic Tacker

This tiny tacker will speed the stringing of wire and hollow tube lines. You can carry it around in your pocket. Tacker drives staple to desired depth, says maker, without marring wire. Front and rear guides circle the wire, permitting rapid drawing around corners and bends.

Staples penetrate plaster, composition board, and hard woods with holding power up to 64 lb.

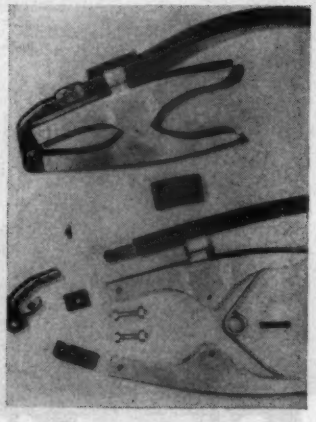
The Heller Co., 2153 N. Superior Ave., Cleveland 14.

Portable Electric Hammer

Alternately energized magnetic coils power this electric hammer at 3600 blows per minute. Maker claims it handles the toughest jobs — drilling and channeling in concrete, chipping, scaling, and cleaning of any material.

There's only one moving part — no gears, cranks, or rods. Unit weighs 20 lb. Steel carrying case also holds selenium rectifier, 15-ft. rubber cord, and accessories.

Skilsaw, Inc., 5033 Elston Ave., Chicago 30.



500-Ampere Ground Clamp

Replaceable contact jaw on the Caddy 500-amp. ground clamp is a high-conductivity copper casting. The jaw is insulated from the clamp body to prevent arc damage to the clamp.

The ground cable is welded to the jaw by the Cadweld process (FACTORY, Dec. '50, p. 156). The high conductivity connection won't burn up under excessive overload, says maker. Clamp body is pressed steel.

Erico Products, Inc., 2070 E. 61st Place, Cleveland 3.

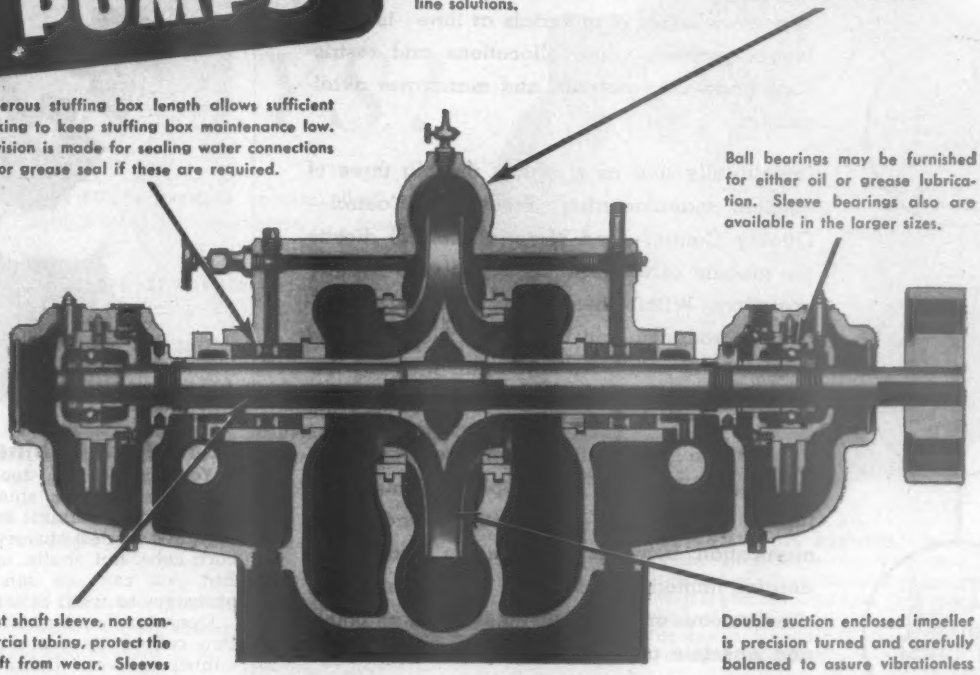
More on next page

ALLIS-CHALMERS Double Suction PUMPS

Standard and special materials available for many types of service. Iron, bronze, stainless steel and combinations of these materials handle both acid and alkaline solutions.

Heavy, horizontally-split cast-iron casing construction with suction and discharge nozzles located in lower half for easy inspection without disturbing piping.

Generous stuffing box length allows sufficient packing to keep stuffing box maintenance low. Provision is made for sealing water connections or for grease seal if these are required.



Ball bearings may be furnished for either oil or grease lubrication. Sleeve bearings also are available in the larger sizes.

Cast shaft sleeve, not commercial tubing, protect the shaft from wear. Sleeves extend through the stuffing box and seal at the impeller hub.

Standard sizes range from 10 to 7000 gpm with heads as high as 475 feet. Larger sizes are available.

Double suction enclosed impeller is precision turned and carefully balanced to assure vibrationless operation and close wearing ring clearance. Water passages are hand finished to a smooth surface.

Built for LOW MAINTENANCE

GENEROUS CONSTRUCTION is a term you'll often hear describing Allis-Chalmers double suction pumps. That is because these pumps are built with the extra metal thicknesses, extra strong parts, extra construction features and extra careful workmanship that means lower pumping costs for you.

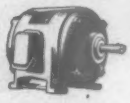
Every Allis-Chalmers double suction pump is carefully tested on the most modern pump testing equipment in the industry. Each installation is individually engineered by men with experience in thousands of pump installations to give you exactly the right pump for your needs.

Allis-Chalmers can take full responsibility for your pumping operation because Allis-Chalmers can furnish the complete installation—pump, motor, drive and control—all built of coordinated design by one manufacturer. Efficient operation is assured and installation problems are reduced.

Whatever your pumping problem, call the nearest Allis-Chalmers Authorized Dealer or Sales Office or write Allis-Chalmers, Milwaukee 1, Wisconsin for Bulletin 08B6146. A-3266

Sold . . .
Applied . . .
Serviced . . .

by Allis-Chalmers Authorized Dealers, Certified Service Shops and Sales Offices throughout the country.



MOTORS — ½ to 25,000 hp and up. All types.

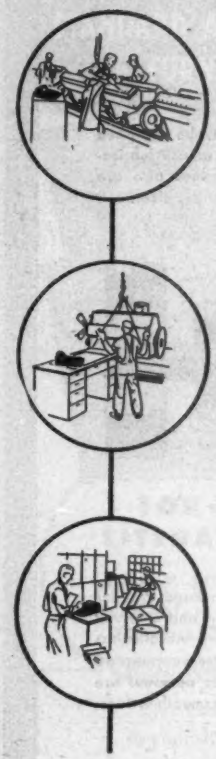
CONTROL — Manual, magnetic and combination starters; push button stations and components for complete control systems.

TEXROPE — Belts in all sizes and sections, standard and *Vari-Pitch* sheaves, speed changers.

Texrope and *Vari-Pitch* are Allis-Chalmers trademarks.

ALLIS-CHALMERS

WASTE!



Waste—whether of materials or time—is a still bigger problem when allocations and restrictions gnaw into material and manpower availability.

Individually and as a group, the big three of efficient manufacturing: Production Control—Quality Control—and Material Control dictate the amount of waste to be coped with by any company. Within these three 'controls,' the cohesion brought about by proper planning and execution is vital. An important facet of this cohesion is proper communication.

TelAutograph telescribers continue to perform an outstanding part of well-planned manufacturing. Handwritten telescriber message communication between departments and plants assures immediate "delivery" of the message, simultaneous arrival of the message at all points and absolute accuracy. All messages are received in the same handwriting as the original transmission.

For detailed information on the use of TelAutograph Telescriber Systems in your plant write to Department B-3.

TelAutograph CORPORATION

16 West 61st Street, New York 23, New York

"Handwritten Messages Deliver Themselves . . . While You Write"

NEW MAINTENANCE TOOLS & SUPPLIES

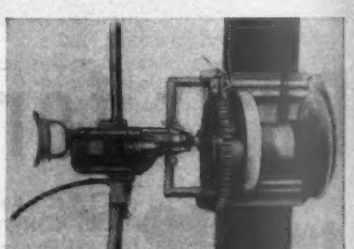
Begins on page 156

Sandblast Cabinet

You can clean tools, pistons, valves, and other small parts in this handy sandblast cabinet. It's designed for soft abrasives—ground corn cobs, nut shells, and the like. But you can use sand or metal abrasives as well.

Operator handles work through two rubber sleeves with attached rubber gloves. Cabinet contains two light fixtures for inside illumination, exhaust fan, and dust bag.

The W. W. Sly Mfg. Co., 4700 Train Ave., Cleveland 2.



Combination Hoist and Power Winch

Portable drill one minute—power hoist the next. A simple adapter kit—requiring no special tools for mounting—locks a Skil hand drill and an American Handiwinch into one power hoist unit. Hoisting capacity is 1000 pounds at 10 fpm. Take the drill out of the hoist bracket and it's ready for any drilling job.

Skilsaw Inc., 5033 Elston Ave., Chicago 30.

More on next page

NOW . . . Coppus-Dennis FANMIX Action REVOLUTIONIZES OIL BURNER PERFORMANCE 6 WAYS!

1. **INCREASES BOILER RATINGS** because all of your furnace space is used for combustion . . . none for mixing.

2. **STEPS UP FUEL EFFICIENCY** because complete combustion is guaranteed with 5% to 10% excess air.

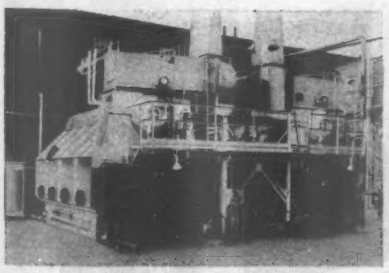
3. **GETS RID OF "HOT SPOTS"** because continuous explosion kills torch action and disperses heat uniformly.

4. **ELIMINATES FORCED DRAFT EQUIPMENT** because FANMIX action itself overcomes the entire draft loss across the burners.

5. **CUTS STACK REQUIREMENTS** because the forced draft created by FANMIX action calls for less furnace draft.

6. **REDUCES COKING OF ATOMIZERS** because their tips are air-cooled by the fan blades to a point well below the coking temperature.

COPPUS-DENNIS FANMIX OIL BURNERS, thoroughly proved in important installations for more than two years, utilize jet reaction of steam-atomized oil to rotate a fan which is an integral part of the burner. Automatically adjusted proportion of high velocity air passes at right angles through the sheet of atomized oil to create an ideal mixture for fast, complete combustion — peak efficiency.



COMMERCIAL SOLVENTS CORP. plant, Terre Haute, Indiana, utilizes Coppus-Dennis FANMIX Oil Burners to fire two fully automatic 250 hp steam generators. Installed early in 1948, these two units have since been supplemented by a third.

AMERICAN WOOLEN CO., in one of its plants, has equipped two 1000 hp boilers with six Coppus-Dennis FANMIX Oil Burners.

BROCKTON EDISON CO. relies on four Coppus-Dennis FANMIX Oil Burners in its plant in East Bridgewater, Mass.

ANOTHER
COPPUS
"BLUE RIBBON" PRODUCT

INVESTIGATE! If you share in the responsibility for the efficiency of your firm's boiler operations, it will pay you to learn why Coppus-Dennis FANMIX Oil Burners, made to Coppus Blue Ribbon standards of quality, promise such superior performance. Send the coupon today.

Please attach this coupon to your company letterhead .

COPPUS ENGINEERING CORPORATION
103 Park Avenue
Worcester 2, Mass.

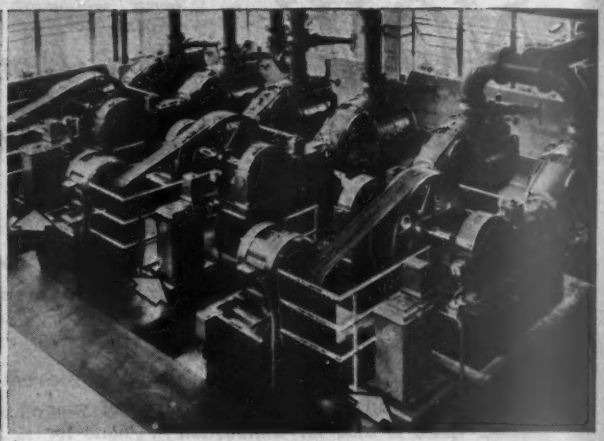
Please send complete data on Coppus-Dennis FANMIX Oil Burners.

Name .....

Company .....

Address .....

City ..... Zone ..... State .....



. . . ON AIR COMPRESSORS . . . ON VACUUM PUMPS

In Protected Rooms, in Coastal Atmospheres, in Dusty Locations...

EC&M OIL-IMMERSED MOTOR STARTERS

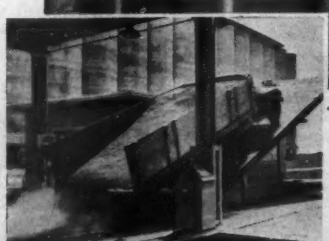
HELP SPEED PRODUCTION IN GULF COAST PLANT

These EC&M reduced-voltage Motor Starters are very popular in industrial plants. *Automatic operation* from push-button stations brings squirrel-cage or synchronous motors up to speed quickly, safely—with greater skill than human hands can do it.

Oil-immersed, the simple double-throw contactor is always well lubricated and protected from corrosion—eliminating the need for frequent inspection or maintenance. Motor circuits are made and broken under oil—thoroughly safe, no dust hazards.

Magnetic overload relays in these starters give inverse-time-element protection and also *trip instantly* on heavy over-currents. A magnetic balance in each relay absorbs heavy starting currents and allows a *low* current-setting for accurate protection under running conditions. EC&M Motor Starters have a reputation for low up-keep cost.

. . ON PROCESS MACHINES



GRAIN RECEIVING STATION

CONNECTIONS FOR 220-550 VOLT STARTING

Complete compensator

Compensator mechanism

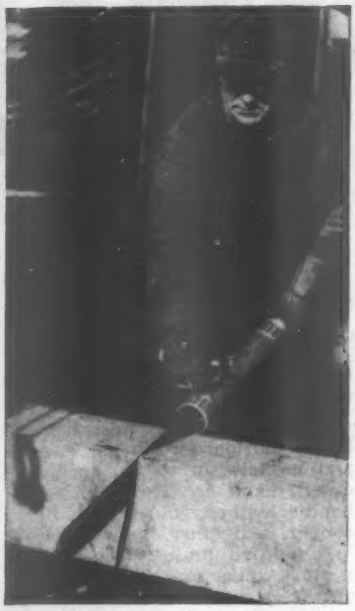
Write for Bulletin 1045 and No. 19 ACCELERATOR Bulletin

THE ELECTRIC CONTROLLER & MFG. CO.

2698 EAST 79TH STREET • CLEVELAND 4, OHIO

NEW MAINTENANCE TOOLS & SUPPLIES

Begins on page 156



Power Handsaw

Wright's precision power saw is a mechanized version of the old-fashioned handsaw that is easier to handle and 20 times faster than its predecessor. Two interlocking straight blades reciprocate through a 4-in. stroke at 1500 strokes per min. There's no torque or thrust—opposing motion of the blades balances out.

Designed for heavy timbers, there's no limit to the saw's depth of cut. Blades are 21 inches long. Combination tooth design permits crosscutting, ripping, or notching. It takes only a minute to change blades, maker claims.

The 14-lb. saw operates on 70-100 psi. air pressure, consumes less than 60 cfm. Absence of guards provides unobstructed view of cutting line. Unit is safe to handle. Saw stops automatically, when spring-loaded throttle is released.

Wright Power Saw & Tool Corp., 292 Longbrook Ave., Stratford, Conn.

Tubular Scaffolding

The Safway Steel people claim that an unskilled workman, using an ordinary wrench, can assemble safe, rigid scaffolding to fit building and ground contours. Their system uses aluminum or steel tubing, and simplified quick-acting clamps.

Scaffold tubing comes in 6-, 8-,

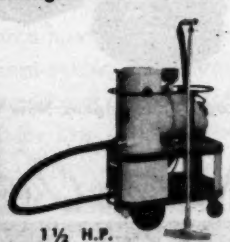
Unusually Large
Cap Screws—
(usually hard to find)
are regular
CLEVELAND
Top Quality
Production
For many years Cleveland has catalogued "larger than usually listed" sizes of hex head Cap Screws—stocks a fair assortment whenever possible—makes for you whatever you need up to 2½" diameter, lengths to 36". Also Set Screws to 1½" x 10". Clean, well-made screws, bright or heat treated. Write for sizes and prices.
THE CLEVELAND CAP SCREW CO.
2917 East 79th Street, Cleveland 4, Ohio
Cleveland's standard line includes hex, flat, socket and fillister head Cap Screws; Milled Studs and Set Screws.
Warehouses: Chicago, Philadelphia, New York, Providence
CLEVELAND Top Quality FASTENERS
originators of the Kaufman Process
DOUBLE EXTRUSION

WHY GOOD *Plant Sanitation* COSTS LESS WITH SPENCER VACUUM

It is a fact that large or congested industrial areas can be Spencer Vacuum cleaned better and faster, at less cost, than by hand or with inadequate power. And with Spencer, the dirt container has ample capacity and is easily removed and rolled on casters to the point of disposal. In addition, special Spencer Vacuum tools take care of overhead pipes, walls, machinery and even the boiler tubes and hot materials which can be removed before they cool off.

AN EXTRA DIVIDEND. But the big saving comes when you apply Spencer Vacuum to the production line. For instance, you can recover valuable metal chips by the ton, convey loose materials by the carload, remove welding and other toxic fumes at their source and speed up bench and assembly work in every department.

There are at least 132 Essential and Unusual Uses for Spencer Vacuum in Industry—all described in Bulletin No. 144—yours for the asking.


1½ H.P.

7½ H.P.

427-B

THE SPENCER TURBINE COMPANY • HARTFORD 6, CONNECTICUT

SPENCER HARTFORD

10-, and 13-ft. lengths. You can use either plain-end sections, or sections with male and female fittings to permit coupling. Two types of clamps fasten upright, horizontal, and diagonal members. Self-aligning clamps accommodate tubes with different diameters.

Safway Steel Products, Inc., 6234 W. State St., Milwaukee 13, Wis.

Punch for Cutting Gaskets, Washers

Centr-O-Punch provides a handy on-the-job tool for cutting washers and gaskets up to 2¼ inches in outer diameter. The punch will handle leather, rubber, soft brass, copper, and other light materials.

A pointed plunger marks dead center when the first (outside) cut is made. This establishes a positioning guids for the second (inside) cut. Material is ejected with each cut—there's no barrel clogging. Various size cutters—nine in all—can be readily interchanged.

Rini Metals Co., Dept. O, 1518 Walnut St., Philadelphia 2.

Multi-Purpose Impact Wrench

This electric nutrunner applies and removes screws, studs, and nuts up to ½-in. bolt size. Versatile Model 2EW will also drill, tap, ream, and extract broken capscrews or studs—power wood augers, hole saws, or wire brushes.

Unit weighs 7 pounds, is 11 inches long. It's powered by a reversible 115- or 230-volt a.c./d.c. motor. An anti-friction bearing eliminates kick and twist in the hand.

Mall Tool Co., 7725 S. Chicago Ave., Chicago 19.

More on next page

most powerful tool for its weight

The CP Super Cycle Grinder packs more power for its weight than any other portable tool.

It works at full speed under all loads; removes more metal at less cost than other grinders; is easier to handle, more quickly located on work, less tiring to hold.

Maintenance is remarkably low. There are no brushes to replace, no armature to burn out, because the motor is of squirrel cage induction type. Operates on 360 cycle, 3-phase, 220 volt current.

Straight grinders have 4", 6" and 8" wheels, or wire brushes. Angle grinders have 6" cup wheels. Angle sanders have 7" and 9" pads.

Write for copy of Catalog 905-2, describing the complete line of CP Super Cycle Tools.

CHICAGO PNEUMATIC TOOL COMPANY

General Offices: 8 East 44th Street, New York 17, N. Y.

PNEUMATIC TOOLS • AIR COMPRESSORS • ELECTRIC TOOLS • DIESEL ENGINES
ROCK DRILLS • HYDRAULIC TOOLS • VACUUM PUMPS • AVIATION ACCESSORIES

STAXAUSTER can be used to convert all types of roof ventilators into powerful exhaust or air supply units.

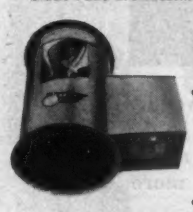
Allen

EXHAUST FANS

Solve Industrial Ventilating Problems Everywhere

Sturdily constructed, economically operating Allen Fan Sections, one shown above, and other types of Allen Exhaust Fans, are engineered to do a completely dependable job. The Staxauster is available in many sizes, including the Remote Drive type shown below—ready to be combined with various stack heads (Allen or other makes) to meet a wide range of needs. Its reputation for reliable performance has been gained through highly satisfactory operation on hundreds of industrial rooftops.

For your wall installation needs, Allen Exhaust Fans and Lo-Noiz-Level Multiblade Fans are recommended.



Remote Drive Allen Staxauster At Left

- Representatives in principal cities listed in our catalog in Sweet's Architectural File, Section 20b.
- Write for catalog.

ALLEN ENGINEERED VENTILATION

PRODUCTION PLANNING CO.

ROCHESTER, MICH.

Roof Ventilators for Every Industrial Need

FILL OUT AND SEND COUPON

PRODUCTION PLANNING CO.
ROCHESTER, MICH.

Please send me informative literature on your complete line of roof ventilators.

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Name _____

Position _____

Address _____

City, State _____

MATERIALS HANDLING

Telescoping Lift With Low Mast

The Mobilift Tier-Master does two jobs in one. Though it tiers three pallets high, you can drive it right into a motor truck van. It lifts 117 inches, floor-to-forks, but has an overall height of only 72 inches with mast lowered.

Unit has 2000-lb. capacity, is powered by gasoline engine. Outside turning radius is 57 inches.

Mobilift Corp., 1135 S. W. Yamhill St., Portland 5, Ore.

Collapsible Wooden Pallet

Here's a pallet that you can pack up into a space-saving unit for ship-and-return work. You can also adjust it to any size or shape to suit the pallet load.

The pallet has four wooden legs mounted in steel plates. Each leg consists of two parallel strips with space between for the lift forks. An eccentric locking lever clamps the legs in any position from fully extended to fully collapsed. Legs also slide in and out through center plates. Collapsed unit takes only 1/5 the space of a conventional pallet.

Spring Woods Products, Inc., Austin Rd., Geneva, Ohio.

More on next page

FIRST Underwriters'-approved bus duct for outdoor use!

BullDog Weatherproof Lo-X BUStribution DUCT

Typical approved bus duct system from outdoor transformer taps . . .

WEATHERPROOFED against *rain, snow, condensation* and *heat,* this is the first bus duct approved by Underwriters' Laboratories for outdoor use and in wet or damp locations.

Here are just four features of BullDog Weatherproof Lo-X BUStribution DUCT that guarantee finest performance inside and outside your plant:

1. **Moisture-proof.** Bus bars are specially wrapped with moisture-proof tape over standard wrapping of varnished cambric. This remarkable tape seals against entrance of moisture, provides a much higher dielectric.
2. **Corrosion-resistant.** Heavy zinc plating, chromate process coating, and alkid resin base paint protect casing and all steel parts from corrosion.
3. **Increased capacity.** Ventilated steel casing not only prevents moisture condensation, but also rapidly dissipates conductor heat for increased current-carrying capacity.
4. **Low voltage drop.** Closely spaced "paired-phase" bus bars hold voltage drop to a minimum by reducing reactance in system.

First bus duct approved by Underwriters for *outdoor* use, BullDog Weatherproof Ventilated Lo-X BUStribution DUCT answers every need of a modern electrical distribution system. Ask your BullDog Field Engineer to show you a typical installation in or near your own plant.

to final load tap-off. Both Standard (indoor) and Weatherproof Lo-X are available from 600 A. to 4000 A. capacities; Plug-In type BUStribution Duct from 225 A. to 1000 A.

BULLDOG ELECTRIC PRODUCTS COMPANY

DETROIT 32, MICHIGAN • FIELD OFFICES IN ALL PRINCIPAL CITIES

IN CANADA: BULLDOG ELECTRIC PRODUCTS OF CANADA, LTD., TORONTO

BULLDOG

PIONEERS IN "ON-THE-SPOT" POWER SYSTEMS

Start With Any One of These

FOUR WAYS To Cut Your Handling Costs

1 WITH ROLLER OR BELT CONVEYORS

— Wherever packages, parts, or units have to be handled — do it faster, better, cheaper, with Standard roller or belt conveyors, power or gravity. Standard also builds slat, chain, wheel, or pushbar conveyors to fit your needs.

2 with a HANDIBELT

— a small, light, compact, easily portable and maneuverable conveyor unit that stacks, loads, unloads cases, cartons, packages up to 135 lbs. in weight. Can be used inclined, declined or horizontal. Electric motor operated.

3 with SPIRAL CHUTES

— effective time, work and money savers lowering pieces, parts, packages floor to floor. Scientifically designed and properly pitched—available in many types and sizes. Cost nothing to operate.

4 with PNEUMATIC TUBE SYSTEMS

— provide swift, sure, safe transportation of messages, documents, blueprints, samples, small parts, money; cylindrical or oval tubes 1½ inch upward with dispatching and receiving terminals for complete systems to meet your needs. Write for special bulletin SPT.

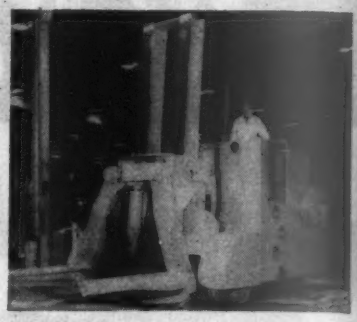
Write for Standard's general Catalog FM-31. Tell us what you want to handle or name equipment on which you want more information.

STANDARD CONVEYOR COMPANY
North St. Paul 9, Minn.
Sales and Service in Principal Cities

Standard GRAVITY & POWER CONVEYORS

MATERIALS HANDLING EQUIPMENT

Begins on page 164



Mammoth Lift Truck for Coiled Sheet Steel

Said to be the largest of its kind, this giant weighs in at 84,000 pounds. It handles a payload of 80,000 pounds. The two snout-like rams open and close like a scissors. Together they can carry one large coil of sheet metal—individually they can handle one smaller coil each.

Despite its size, the truck is said to be an agile monster. Maker claims that you control its hydraulic steering system with a fingertip touch. It takes uneven terrain in stride, too. Articulated construction (independent vertical motion of drive and trailing wheels) permits equal wheel loading despite bumps or declivities.

Lift raises to a height of 91 inches. Overall height is 178 inches. Unit is powered by diesel-electric drive. It's only the first of a series that will include capacities from 20,000 to 100,000 pounds.

The Yale & Towne Mfg. Co., 11000 Roosevelt Blvd., Philadelphia.

Side-Dump Shop Trucks

You can use these trucks for any dry material—parts, bulk, or waste. Maker claims that side-dump feature eliminates shoveling and time-consuming operations. makes disposal of machine chips and scrap easy.

You can tow trucks by hand or by powered vehicle—singly or in

Sixty million is a lot of anything and that is the number of items Townsend can produce in one working day. Lately it just isn't enough to go around. We have strained every facility and every source of raw material to keep our production above average—but we still can't keep ahead of our orders.

So, if our delivery date for large and small cold-headed solid rivets and tubular rivets, special nails, fasteners, parts and other gadgets is longer than usual, please bear with us.

We believe our backlog of orders is in some measure caused by the savings we have created for our customers—so we intend to keep quality up to our rigid standards, no matter how busy we get.

Even if you must wait for delivery—you can count on Townsend quality control which has back of it 135 years of experience in wire drawing and cold-heading.

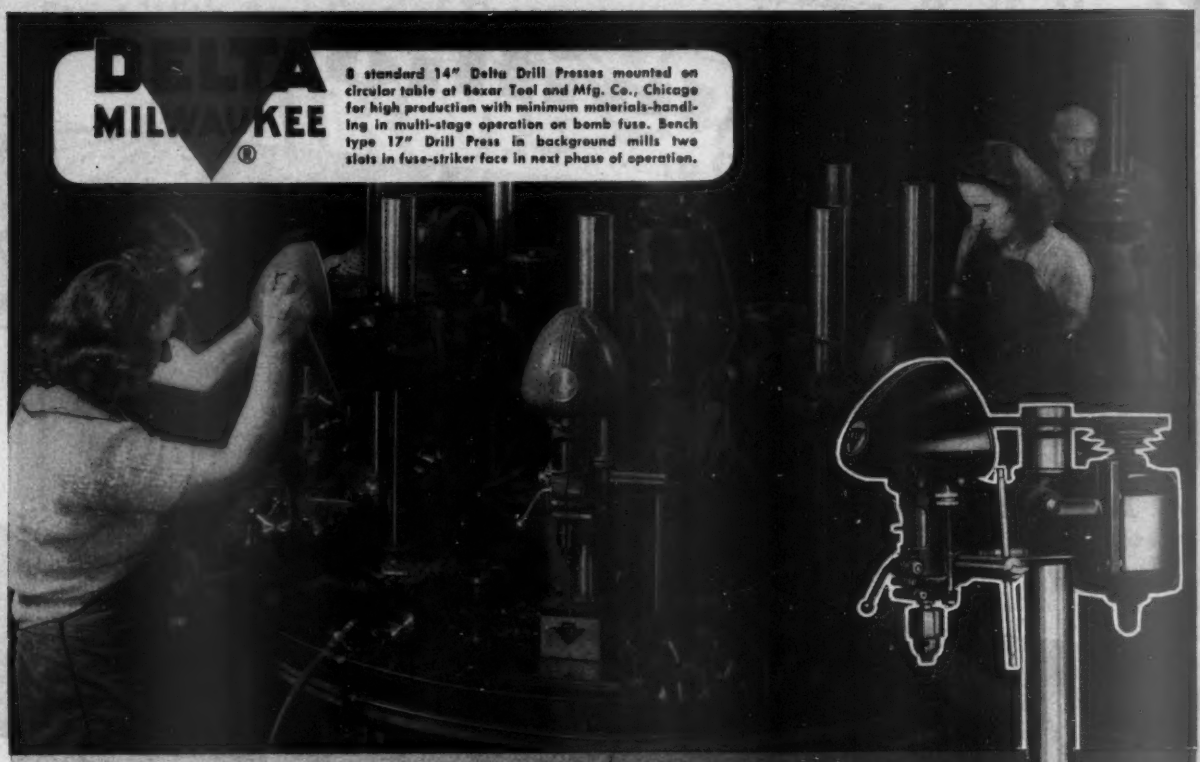
Townsend

COMPANY • ESTABLISHED 1816

Plants—New Brighton, Pa. · Chicago 38, Ill.

Division Sales Offices—Philadelphia, Detroit, Chicago

Sales Offices in Principal Cities



8 standard 14" Delta Drill Presses mounted on circular table at Bexar Tool and Mfg. Co., Chicago for high production with minimum materials-handling in multi-stage operation on bomb fuse. Bench type 17" Drill Press in background mills two slots in fuse-striker face in next phase of operation.

Quick relief for shortage headaches

—low-cost Delta® tools make easy-to-use set-ups when men and machines are scarce

Basic materials are already in short supply. The next pinch will be on men and machines. That's when Delta versatility, plus your own imagination, can save the day. The space-saving, special drill-unit above is only one of hundreds of examples in our files. Its rotary table simplifies parts handling —and dependable Delta drill presses (with fixtures) assure close-tolerance accuracy from untrained operators.

Remember to count on Delta to solve your own drilling problems. A little ingenuity gives you a quick, low-cost solution to meet production's critical standards and rugged schedules.

Send for complete details—and plan your jobs around the versatility of dependable Delta tools—high in quality, low in cost! Delta's engineering service is always ready to help you. *Sold only through authorized dealers—available on easy time payments. Look for the name of your Delta dealer under "Tools" in the classified section of your telephone directory.*

DELTA POWER TOOL DIVISION

Rockwell Manufacturing Company

MILWAUKEE 1, WISCONSIN

Delta • Multiplex • Crescent • Homecraft

Delta 14" Drill Press

Complete selection to meet every need—with the right capacity, the right speed—in floor and bench types... single spindles, multi-spindle batteries, individual heads for special set-ups... power-feed or foot-feed—and a complete line of accessories for every model. The same selection in 17" drill presses. All told, 144 different models at prices from $77.50 to $2,892.50.

From the world's most complete line

First in Selection!
First in Quality!
First in Value!

Tear out this coupon and mail today!

Free...

6 TIMES A YEAR

The Power Tool Journal — packed with detailed job data, fully illustrated — hand-book of time- and money-saving shop ideas!

Delta Power Tool Division
ROCKWELL MANUFACTURING COMPANY
619C E. Vienna Ave., Milwaukee 1, Wisconsin

Send me free —
- ☐ The Power Tool Journal — 6 times a year.
- ☐ Catalogs and bulletins on complete Delta line.

Name.....

Title.....

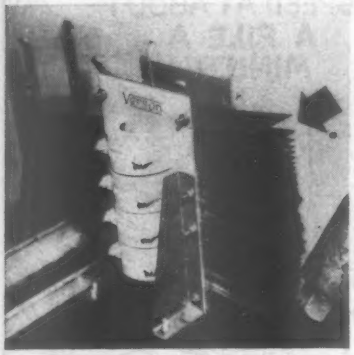
Company.....

Address.....

City.....( ) State.....

trains. Trucks have 1 cubic yard capacity, measure 3x6 feet x 140 inches high. Frame is structural steel—wheels, iron or rubber. Sheet metal hod is welded at the joints. It's counterbalanced to make dumping easier.

The Klaas Machine & Mfg. Co., 4322 E 49th St., Cleveland 25.

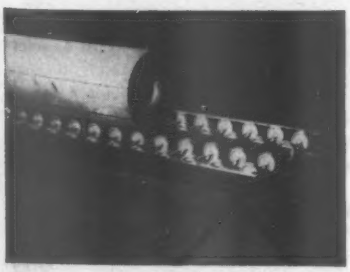


Sheet Steel Separator for Feeding Presses

The Verson Magnetic Sheet Floater literally floats steel sheets to operators working punches and presses. It cuts down on glove damage and injury to workers' hands in handling sharp sheet edges, maker claims. It also ups your productive rate.

Sheets to be worked on are stacked in steel bins. A permanent-type plate magnet magnetizes each one of the sheets. The steel strips repel one another and fan out as shown above. The operator just plucks the top sheet out of the air to feed into the press. You can handle blanks and irregular shapes in a similar manner.

Verson Allsteel Press Co., 9323 S. Kenwood Ave., Chicago 19.



Conveyor Section for Cylindrical Rolls

You can move drums, rolls, or other smooth cylindrical objects down the center channel of a Speed wheel conveyor. Cylinders up to 60 or 70 pounds per foot make the

Rubber-base (Parlon®) Paints GIVE EXTRA PROTECTION against Acids and Alkalies

Where other paints fail because of acid or alkaline plant conditions, it may pay you to specify corrosion-resistant, rubber-base paints. For concrete and most metal surfaces, paints properly formulated with "Parlon" (Hercules Chlorinated Rubber) are unsurpassed for resistance to common destroyers of maintenance paints. Besides alkali and chemical resistance, these paints have outstanding wear resistance, dry fast, and are easy to apply.

More than 500 paint manufacturers now offer one or more rubber-base paints made with chlorinated rubber. These maintenance paints may cost a little more per gallon, but usually cost far less per square foot per year. We'll be glad to supply the names of several firms in your locality who can advise you.

HERCULES POWDER COMPANY
INCORPORATED
905 Market St., Wilmington, Del.

Send further details on "Parlon" paints and names of suppliers.

Name_____

Company_____

Address_____

CR51-1

POP'S school of filing
THERE'S "WRONG-WAY" HARRIGAN BURNING UP FILES NOT INTENDED FOR STAINLESS STEEL!
YEH, AN' POP'S ABOUT TO BURN HIS BRITCHES WITH A BLISTERIN' LESSON ON USIN' THE RIGHT FILE FOR THE JOB!
AS A FILE DRIVER I'D TIME "WRONG-WAY'S" SPEED AT ABOUT A FILE A MINUTE!!
STAN RANDALL

LIKE any foreman interested in high production with minimum tool wastes, Pop can't be blamed for "blowing his top" over the sad scene enacted above. Using the wrong file for the job is as costly a tool abuse as using any file carelessly. Take stainless steel, for example:

Stainless steel is a tough, dense metal which tends to have a wearing effect on all cutting tools —and files are no exception. Better results are obtained when Nicholson or Black Diamond files "For Stainless Steel" are selected. These are made with specially sharpened teeth to assure faster cutting and longer file life. They are made in the same types and sizes as regular-purpose files. "For Stainless Steel" is stamped on the tang. Sold through industrial distributors.

THE NATIONAL DEFENSE PROGRAM calls for again conserving steel. You can aid by making files last longer—(1) through correct use and proper care of files and (2) through use of *The right file for the job.* The following booklets, handed to purchasing and production heads, are valuable helps. Write for as many copies as you can use judiciously.

"TEN SPECIAL FILE TYPES" *"FILE FILOSOPHY" (on kinds, use and care of files)*

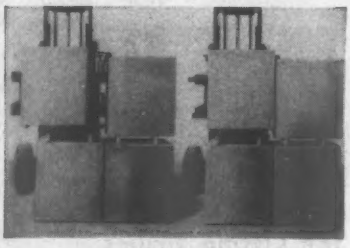
NICHOLSON U.S.A. **NICHOLSON FILE CO. • 27 ACORN STREET • PROVIDENCE 1, RHODE ISLAND** BLACK DIAMOND TRADE MARK
(In Canada, Port Hope, Ont.)

NICHOLSON . . . A FILE FOR EVERY PURPOSE

gravity run on straight sections without guides or rails.

You can handle cartons and boxes on them too. Conveyor can be used on both the high wheel and low wheel side. Sections come in 12-, 15-, and 18-in. widths with specified wheel or roller spacing. —in 5- and 10-ft. straight lengths, 45- and 90-deg. curves.

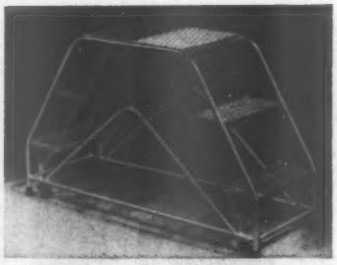
Speedways Conveyors, Inc., 1261 Niagara St., Buffalo, N. Y.



Side-Shifter Accessory for Fork Lift Truck

When you find yourself in position A (left above), an Erickson side' shifter will get you into Position B (right above) with no waste motion. This lift truck attachment can shift fork loads 3½ inches to left or right of normal center position. It's a time-saver that enables you to pick up and stockpile without jockeying for perfect alignment. Hydraulically-operated units come on maker's new trucks—can also be added to models now in service.

Erickson Power Lift Truck, Inc., Dept. H., 1401 Marshall N. E., Minneapolis 13.



Double-Step Safety Ladder

Two or more people can use the Ballymore ladder at one time on large assembly jobs. It has expanded steel steps at both ends. Ladder frame is made of welded tubular steel. The unit measures 30 inches high, 17½ inches wide, and 48 inches deep.

The Ballymore ladder won't roll while you're standing on it. Your weight deflects the spring-mounted

NEW, FREE BULLETIN
Helps You Solve 8 Shipping Room Problems

Read How The Right Bostitch Stapling Machines Can:

1. SAVE SPACE — With speedy Bostitch bottomers keeping pace with production, you don't have to set up and store containers in advance.

2. BREAK BOTTLENECKS — Bostitch machines are so fast, many manufacturers put them right into their production lines.

3. IMPROVE FASTENING — Unlike adhesives, Bostitch staples can't let go, regardless of temperature and humidity conditions.

4. REDUCE DAMAGE — Many Bostitch users have proved that properly engineered corrugated containers often give better protection than bulky wooden crates.

5. IMPROVE APPEARANCE — Bostitch staples do not interfere with container design or obliterate part of the printed message.

6. STOP PILFERAGE — Inexpensive Bostitch machines clinch staples so tight that pilferage can be immediately detected — eliminating hidden losses.

7. FIT INVESTMENT TO NEEDS — Choose inexpensive hand- or foot-operated Bostitch machines when production is not large; high-speed models for low fastening costs on large production.

8. CUT COSTS — The many advantages of Bostitch stapling often save 50% — sometimes as much as 80% — in fastening costs.

SEND FOR BULLETIN 267 TODAY!

This free bulletin illustrates and describes 30 of the more than 800 Bostitch hammers, tackers, stapling machines and wire stitchers. It shows you how to use them . . . gives proof of big savings in time and money in twelve important shipping operations. Based on more than 50 years' experience in fastening, this bulletin may show you a quick, easy solution to your fastening problems. Get your copy by mailing the coupon below today.

PLEASE ATTACH THIS COUPON TO YOUR FIRM'S LETTERHEAD

BOSTITCH, 408 Mechanic Street, Westerly, R. I.
Please send me your new, free Bulletin 267 — "How Bostitch Can Save You Time and Money in 12 Important Shipping Room Operations."

Name..... Title.....
Firm.....
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City..... Zone..... State.....

BOSTITCH
fastens it better, AND FASTER, with wire

ALL TYPES OF MACHINES FOR APPLYING STAPLES
ALL TYPES OF STAPLES APPLIED BY MACHINES

Trade-Mark "Bostitch" Registered U. S. Patent Office and Foreign Countries.

casters so that rubber-tipped legs contact the floor. It's finished in aluminum paint.

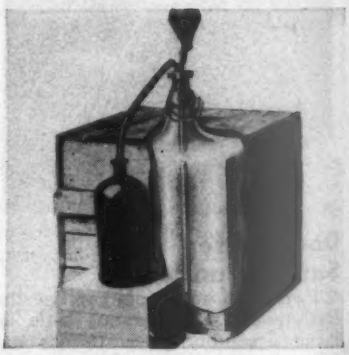
Ballymore Co., 139 Pennsylvania Ave., Wayne, Pa.

Clamp Attachment for Lifting Drums

One Baker lift truck can handle individual barrels and rolls as well as unit pallet loads. The company's new drum clamp makes the 2-in-1 job possible with a minimum of adjustment.

Two rubber-faced grab plates—one attached to each fork—handle the cylindrical loads. To handle pallet loads in the conventional manner, you simply slip the grab plates off. The forks move simultaneously together or apart under hydraulic control. You can vary fork spread from 32 to 19 inches inside spacing. Close control of gripping pressure permits the handling of cardboard drums without crushing.

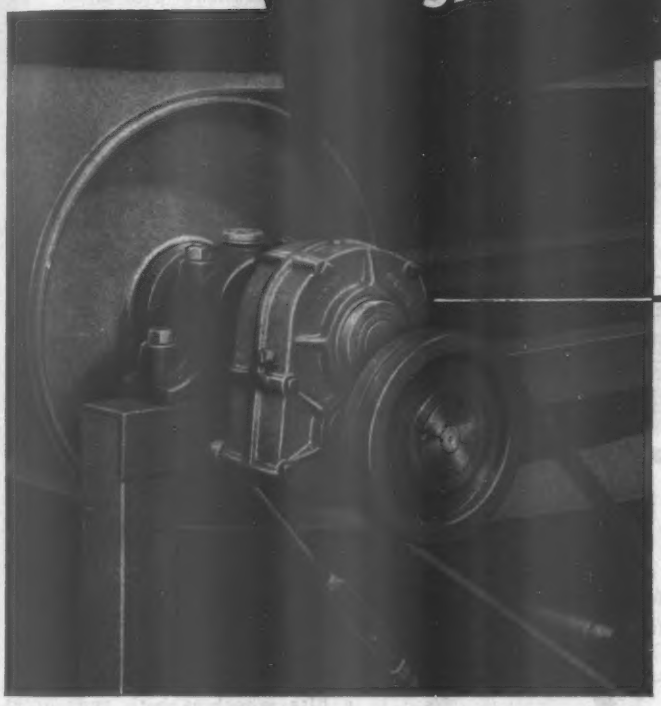
The Baker-Raulang Co., Baker Industrial Truck Div., 1250 W. 80 St., Cleveland 2.



Bulb-Type Acid Pump

This is one simple solution to the problem of transferring acids from original containers—and cutting down on objectionable fumes. You won't need a funnel either to fill bottles with small neck openings. The hand bulb applies pres-

THE SPEED REDUCER THAT SAVES YOU MONEY!



Dodge

Torque-Arm

America's Most Complete Line of Shaft-Mounted Speed Reducers

- No special engineering required. No foundation to provide. No flexible couplings. No sliding base. No "lining-up" difficulties. No expensive installation. Stock TAPER-LOCK sheaves prescribed for each job to provide desired speeds. Application to other machines is practical and easy.
- Unit is driven through any V-Belt Drive. Torque-arm, fastened to any fixed object, anchors the reducer unit. Turnbuckle provides fast and accurate adjustment of belt tension.
- Backstop available from stock when required. Simple. Positive. Easily installed. Sealed inside the reducer housing.
- Compact, light weight, *rugged.* Quality built by Dodge for Dodge *dependable* service.
- Built in two series—Single and Double Reduction. Capacities from 1 to 27 h. p. Speeds from 12 to 330 rpm. Available from distributors' stocks.
- WRITE for special bulletin A602.

DODGE MANUFACTURING CORPORATION, 400 Union Street, Mishawaka, Indiana

DODGE
of Mishawaka, Ind.

CALL THE TRANSMISSIONEER, your local Dodge Distributor. Factory trained by Dodge, he can give you valuable assistance on new cost-saving methods. Look for his name under "Power Transmission Equipment" in classified phone book.

FIRST IN POWER TRANSMISSION MACHINERY!

V-BELTS AND TAPER-LOCK SHEAVES

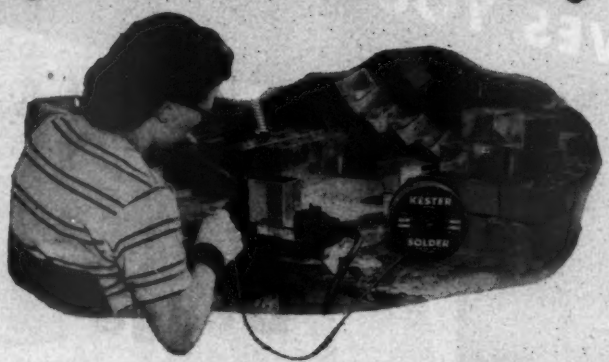
DODGE-TIMKEN PILLOW BLOCKS

ROLLING GRIP AND DIAMOND D CLUTCHES

SOLID STEEL CONVEYOR PULLEYS

FOR YOUR NAME PLATE REQUIREMENTS, WRITE OUR SUBSIDIARY, CHICAGO THRIFT-ETCHING CORPORATION, 1555 SHEFFIELD AVENUE, CHICAGO, ILLINOIS

Kester Solder



Flame Soldering with Kester "Nosput" flux-core solder. One of Kester's specialized industrial solders that does this job better than any other solder.

No Waste

"Nosput" flux-core solder is only one member of Kester's famous group of flux-core solders. In all there are over 100,000 different types and sizes.

Efficient

Kester can supply the right solder for the job, virtually eliminating waste and rejects. Call in a Kester expert and have him analyze your customers soldering operations.

Kester Solder Company
4201 Wrightwood Ave. • Chicago 39, Illinois
Newark, New Jersey • Brantford, Canada

Send for free manual: "SOLDER and Soldering Technique"

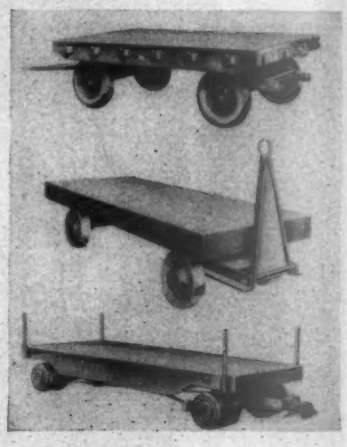
KESTER SOLDER

Standard for Industry since 1899

sure to the top of the liquid, forcing it out the overflow tube in a continuous stream.

Valve action, says maker, assures smooth flow—no spurts from start to finish. Overflow pipe has no connection with the valve body, and when the pump is withdrawn, no acid remains in it. Maker says it serves as a gage, too, showing the amount of acid left in the carboy. Available with saran, lead, hard rubber, or aluminum tubes.

Hanson-Van Winkle-Munning Co., Matawan, N. J.



Heavy-Duty Trailers

Three new trailers that you can use either singly or in tandem will handle heavy-duty hauling. You can get any one of the models with a fifth wheel at both ends or at one end only.

Model TFP-100 (top above) is a 5-ton trailer with 16-in diameter pneumatic tires. Clearance is 40½ inches. Comes with stake pockets.

Another 5-ton unit, the Model TF-100 (center), has solid rubber tires. This unit stands 23 inches high. Four stake holes are provided on each side.

The Model TF-300 (bottom), for handling heavier jobs, has a 15-ton capacity. This unit has dual solid rubber-tired wheels, and removable stakes at each corner. Overall height is 24 inches.

Phillips Mine & Mill Supply Co., 2324 Jane St., Pittsburgh 3.

Portable Boom Hoist

Having trouble moving equipment that's inaccessible to your overhead cranes? The Latch Hoist and Carry—a caster-mounted boom hoist—is made for just such jobs.

One man can move the unit and operate the boom. You can reach in with the 7½ foot boom to pick up motors, power drives, or heavy

the DIRTIER the better for LAN-O-KLEEN!

DIRT that's really hard to remove . . . that's deeply imbedded in workers' hands . . . that irritates cuts and abrasions—directly affects production figures! Think of the materials your present cleaner won't remove: graphite and metallic dust . . . heavy grime and lubricants . . . even common soil and office dust—no matter how hard you scrub!

LAN-O-KLEEN, the industrial soap powder, is designed for "heavy-duty" dirt removal. A fine corn meal base sponges out the pores . . . while thick suds sweep away surface dirt. As water is added, soothing Lanolin spreads over the skin, leaving hands fresh-feeling and clean as a whistle. Its soothing emollient action won't aggravate cuts and bruises. Further, Lan-O-Kleen and the sturdy Lan-O-Kleen dispenser are a dollar-saving combination—as a West representative can easily demonstrate.

LAN-O-KLEEN the industrial hand cleaner containing LANOLIN

WEST DISINFECTING Company

Show me the hand cleaner that will remove stubborn dirt!

West Disinfecting Company, 42-16 West Street, Long Island City 1, N. Y.
(64 Branches in the U. S. and Canada)

Gentlemen: I'd like to have a local WEST representative come out and give me a demonstration of Lan-O-Kleen.

Mr. _____ **Position** _____

Company _____

Address _____

City _____ **Zone** _____ **State** _____

3

READY TO SERVE YOU... A GREAT *NEW* APPLETON REELITE!

Here's the new, *all new,* Appleton 7S Portable Reelite—a compact, automatic cord take-up reel that solves the countless lighting problems of car-loading, machine inspection, maintenance work—any job that requires good illumination in out-of-the-way places.

Double silver alloy collector brushes—one of many outstanding new features—permit continuous rotation of the entire reel in either direction without power interruption or tangling of the cord. This versatile device furnishes light—or a flexible power source for power tools—when and where you want it. Positive stop action holds cord at desired length; then cord is automatically re-reeled when job is done.

The Appleton 7S Portable Reelite is completely encased in steel, finished in baked hammertone enamel. It is easily installed on any 4" octagonal outlet box. Available accessories include six types of handlamp, machine tool connector body or key socket. A vaporproof model is furnished complete with handlamp. Write for full details on this and other Portable Reelites.

Sold Through Electrical Wholesalers

APPLETON ELECTRIC COMPANY

1715 Wellington Avenue • Chicago 13, Illinois

Branch Offices and Resident Representatives in All Principal Markets

APPLETON ELECTRIC PRODUCTS

APPLETON

CONDUIT FITTINGS • LIGHTING EQUIPMENT • OUTLET AND SWITCH BOXES • EXPLOSION-PROOF FITTINGS • REELITES

castings in tight spots. A hydraulic jack raises and lowers the boom arm in a vertical plane. Sensitive hydraulic control is said to permit alignments to a fraction of an inch. Maximum lift is 8½ feet. Two models have 2500- and 5000-lb. capacity.

South Chester Corp., 1418 South Penn Square, Philadelphia 2.

Pneumatic Vibrators

Series 79 air vibrators come in 2- and 2½-in. piston diameters with long and standard stroke. They're suggested for use on hoppers, chutes, tables, and molding machines. In hopper installations, the Series 79 vibrator can be teamed with a quick-acting hopper gate valve. The vibrator will then operate only when the discharge gate is opened.

Vibrator bodies are cast from semi-steel. Bronze alloy cylinder liners are said to give smooth, positive operation and long service life. Suitable for both continuous or intermittent duty. Manufacturer's catalog No. 50 describes complete line.

Spo Inc., 6446 Grand Division Ave., Cleveland 25, Ohio

•

HEAT-RESISTANT BELTING will convey red-hot castings, foundry shake-out sand, and other hot materials at temperatures up to 600 degrees F. Super-insulated Sahara is made of heavy silver duck combined with asbestos and special insulating materials. Imperial Belting Co., Dept FMM, 1750 S. Kilbourn Ave. Chicago 23.

VERTICAL BOWL FEEDERS come with two or three feeding tracks. Small parts, ranging from tiny rivets to mower blades, move up the spiral tracks under vibration, discharge at selected points around the bowl circumference. Syntron Co., 480 Lexington Ave., Homer City, Pa.

More on next page

These men can work in comfort, close to and facing the window, because Blue Ridge Frosted *Aklo* Glass filters the incoming daylight to reduce glare and heat. Springs Cotton Mills, Lancaster, S. C.

STEP UP PRODUCTION with

FILTERED DAYLIGHT

Good daylight—plenty of it—with reduction of glare and sun heat, are conditions that can help you step up production. They are conditions you get with Blue Ridge Frosted *Aklo** Glass.

IMPROVES SEEING. Tired, squinting eyes just aren't conducive to good work or speed. Blue-green Frosted *Aklo* Glass diffuses the sharp rays of the sun and reduces sky brightness—floods the interior with soft diffused daylight. It's like having sunglasses in your windows. Better workmanship and reduction of accidents are natural results of better seeing. With Frosted *Aklo* Glass there's no need to bother with shades or unsightly painting of the glass.

PROVIDES GREATER COMFORT. *Aklo* Glass excludes three times as much sun heat as does ordinary glass. It makes plants cooler—aids in temperature control and reduces load on air conditioning. *Aklo* Glass is particularly valuable for south and west elevations and for skylights where sun heat presents most severe problems.

People like to work in plants equipped with Frosted *Aklo* Glass—there's a restful pleasantness to its soft blue-green color. See for yourself how Frosted *Aklo* Glass reduces glare and sun heat. Ask your Libbey·Owens·Ford Distributor for a Radiometer demonstration. *Aklo* Glass is made by the Blue Ridge Glass Corporation of Kingsport, Tennessee and sold by L·O·F Glass distributors. Mail the coupon for full information on *Aklo*.

*®

Free Book on Reduction of Sun Glare and Heat

Blue Ridge Sales Division
Libbey·Owens·Ford Glass Company
B-1631 Nicholas Building, Toledo 3, Ohio

Please send me a copy of your book on glare and heat reduction, "Filtered Daylight".

Name _____

Company _____

Address _____

BLUE RIDGE AKLO GLASS

Heat Absorbing • Glare Reducing • Figured and Wire Glass

Control Costs with TOLEDO!

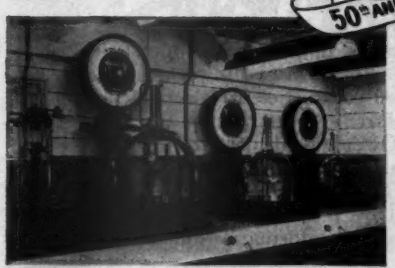
PACKAGE CHECKING. Shipments automatically checked and weights printed.

BATCHING. Toledos save time and safeguard quality . . . make batching quick and sure.

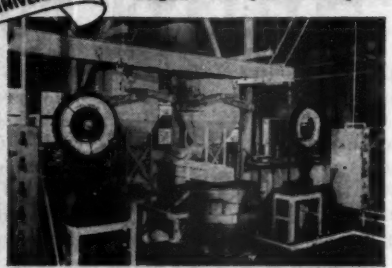
COUNTING. These Toledo Scales count small parts rapidly and accurately.

1901 1951 50th ANNIVERSARY

PRINTWEIGH SCALES stop errors... print big figures — accurate weights—with split-second speed.



FORCE-MEASURING. These Toledos used for compression testing of a wide variety of coil springs.



AUTOMATIC CUT-OFF. Groups of scales can be electrically interlocked for completely automatic batch control.

After you've fought the battle of high costs, "criticals" and shortages to obtain materials—don't waste them through careless handling! Tighten your control at every step! See that you have up-to-date scales—and enough scales—throughout your materials handling operations. See if you could use Printweigh to stop losses through human errors. Whatever your problems in weighing, checking, testing, counting, batching or force-measuring . . . there's a modern Toledo to do a better job. Send for latest weight control bulletin 2020X. Toledo Scale Company, Toledo 1, Ohio.

PRINTED WEIGHTS!

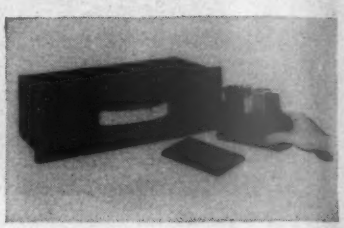
Toledo Printweigh Scales provide printed weight records... assure you that the accurate indication of the Toledo dial will reach your accounting records without chance of human error.

TOLEDO

HEADQUARTERS FOR SCALES

Begins on page 136

MEASURING & CONTROL APPARATUS



Plug-In Pyrometer

A new GE pyrometer provides temperature indication, control, and protection for industrial furnaces, ovens, and kilns. Plug-in indicators, controllers, and protectors—housed in flush- or surface-mounted cases—can be replaced as entire units, permitting immediate return of equipment to service in the event of failure.

The indicating millivoltmeter connects to a thermo couple in the heating equipment. Calibrated accuracy is said to be within ¾ of 1% of full scale. Changes in temperature equivalent to 1/10 of 1% of fuel scale start control action. Indicator is sealed against humidity and dust. Maker claims ambient temperature and voltage won't influence control action.

General Electric Co., Schenectady 5, N. Y.

Continuous Process Density Meter

Densitrol gives a continuous measurement and control of liquid density in your process lines. The instrument operates as a simple bypass in any liquid line or vessel. Specific gravity is read directly. It's suggested for use where periodic density checks must be made, or where process characteristics such as corrosiveness or inflammability prevent you from sampling the system.

The measuring element is a chain-weighted plummet. It's totally submerged in the liquid so that there is no liquid and air interface to affect the reading. You

PROVED IN PERFORMANCE

Grinnell-Saunders Diaphragm Valves with KEL-F Diaphragms are living up to every promise made for them! At the right are reports from typical users.

KEL-F's resistance to chemical action, low cold flow, wide range of temperature application and exceptional flex life combine to make it the most important diaphragm development in years. KEL-F is chemically inert to all organic acids and alkalies in all concentrations. It withstands chlorinated aliphatic and aromatic compounds, concentrated nitric, chromic, hydrofluoric and sulphuric acids and most solvents which readily attack rubber and previous synthetic diaphragm materials.

While KEL-F is tough and flexible, it is not resilient. To provide resiliency for proper closure of the valve and to provide added support for the KEL-F diaphragm, it is backed with a rubber cushion. A free-floating method of attachment to the compressor assures an even closing pressure on the entire surface of the weir. A tube nut which floats as the rubber cushion presses down in closing the valve, eliminates excessive pressure on the diaphragm stud. The rubber cushions the closing force, thereby reducing wear and cutting action on the diaphragm. In accelerated tests, a 2-inch valve with a KEL-F diaphragm withstood over 80,000 closures, drop tight, against 80 pounds of air under water with no leakage and no visible signs of wear. Write for complete information.

Typical performance reports . . .

1. Chlorine and HCl gas with small amounts of acetic acid and acetyl chloride at 302° F. for 900 hours. Very much superior to material it replaced.
2. Mixed aromatic and ketone solvents at 230° F. and 10 psi for three months. No sign of deterioration.
3. Chlorinated organic chemical at 158 to 194° F. and 30 to 40 psi for nine months. No failure, no shutdown, no replacement.
4. Chromyl chloride at ambient temperature and 15 psi. Diaphragm condition good at end of thirty days' test.
5. Liquid chloral saturated with HCl at 158° F. for 408 hours. Well satisfied — have placed orders for additional diaphragms.

*"KEL-F" is the registered trade name for polytrifluorochlorethylene, an exceptionally stable thermoplastic. It is produced by the M. W. Kellogg Co.

GRINNELL

WHENEVER PIPING IS INVOLVED

GRINNELL COMPANY, INC., Providence, R. I. Warehouses: Atlanta • Billings • Buffalo • Charlotte • Chicago Cleveland • Cranston • Fresno • Kansas City • Houston • Long Beach • Los Angeles • Milwaukee • Minneapolis • New York Oakland • Philadelphia • Pocatello • Sacramento • St. Louis • St. Paul • San Francisco • Seattle • Spokane

MOTOR WHEEL CORPORATION

LANSING 3 MICHIGAN

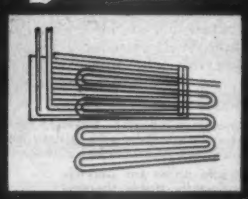
finds PLATECOILS more efficient – require 90% less cleaning

The advantages of Platecoils for tank heating and cooling make themselves felt in many ways. An example is the Motor Wheel Corporation, where Platecoils have replaced pipe coils for heating a bonderite washer. Mr. C. V. Lovell, Chief Draftsman, Maintenance Department, says Platecoils "are more efficient for the following reasons: "First, the scale formed by the solution does not adhere as readily to the smooth surface of the Platecoils and secondly, a large percentage of the scale that does collect is flaked off. Naturally this allows the Platecoil to be a better heat conductor . . ."

HOWEVER, THE GREATEST SAVING seems to be in the amount of time consumed in cleaning the coils. The pipe coils were cleaned every thirty days by the hammer and chisel method and required about five man hours per coil, including removal and replacement time.

The Platecoils are cleaned by brushing every sixty days and require about one man hour per coil including removal and replacement time.

In terms of dollars and cents this amounts to a saving of approximately $7.20 per coil per month . . ."



Cleaned and Repaired Without Dumping Tank Solution
Greater BTU Transfer Per Unit Area
Weighs Only Half as Much as Pipe Coil
No Threaded Joints in Tank
Increased Tank Capacity
Fast, Easy Installation
Easy to Clean

PLATECOIL
Division
KOLD-HOLD MFG. CO.
LANSING 4, MICHIGAN

can get any calibration—Baume, specific gravity, or degrees API—within a full scale range of 0.2 to 0.005 density. Suitable for either clear or opaque liquids.

Precision Thermometer & Instrument Co., 1400 Brandywine St., Philadelphia 30, Pa.

Overhead Scale

Eight new models of the Dillon Weight Indicator have capacities ranging from 250 to 20,000 pounds. You can use them to weigh on the spot long or bulky objects that can't be moved to central weighing points. Accuracy is roughly 0.2% of full scale reading. A zero adjust—a slotted set screw—compensates for tare loading.

Heart of the scale mechanism is a calibrated, tapered beam that is deflected by the load through compound levers. The full load deflection of less than ⅛ inch may save you valuable headroom. Scale is dustproof, requires no oiling. Scale pointer is mechanically dampened.

W. C. Dillon & Co., Inc., 1421 S. Circle Ave., Forest Park, Ill.

Vacuum Gage

As many as five stations can be connected to each Hastings vacuum indicator through a standard selector switch. The unit measures absolute pressure from 0 to 1000 microns of mercury. Its accuracy and quick response are said to suit it for leak detection work or pressure-operated control systems.

Matched gage tubes eliminate the need for additional adjustments when switching from station to station. The gage measures vacuum as a function of the thermal conductivity of a gas. It's direct reading.

Hastings Instrument Co., Inc., Super Highway & Pine Ave., Hampton 10, Va.

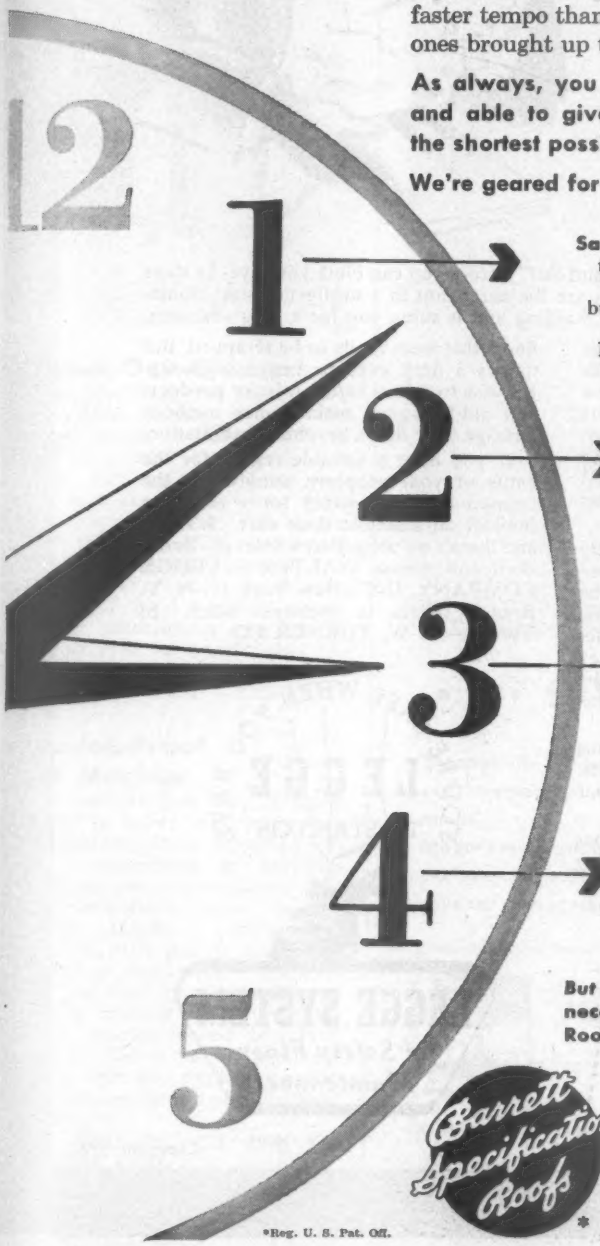
More on next page

When you're roofing against TIME specify Barrett for ACTION!

The day of the "rush job" is back with us again. As a result of America's big rearmament program, you'll be expected to accomplish results at a faster tempo than ever before. New plants will have to be built and old ones brought up to standard . . . *in a hurry.*

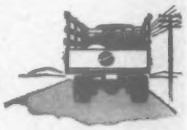
As always, you can count on Barrett to help you. Barrett is ready and able to give you the world's longest-lasting built-up roof in the shortest possible time.

We're geared for action four ways:



Save time on specifications. We have time-tested, scientifically calculated application specifications on hand for almost every built-up roofing problem. These are so foolproof that Barrett* Specification* Roofs can be *bonded* for 20 years, and generally last much longer. Approved by the National Board of Fire Underwriters—Class A.

Save time on delivery. Strategically located supply points enable us to rush materials to your contractor, and to your job when they are needed.



Save time with uniform materials. Barrett* coal-tar pitch and felt are made in our own factories, where their uniformity is rigidly controlled —an advantage in application as well as in final results. Only highest grade materials reach your job when you specify a Barrett Specification* Roof.

Save time on the job. Good men make for fast jobs. Barrett Approved Roofers have many years of practical experience, plus well-trained manpower, plus Barrett engineering help, to assure you the finest possible roofing job in the shortest possible time.

***But don't wait* until you're up against it before ordering necessary roof improvements. Call in a Barrett Approved Roofer today, or write us.**

Barrett Specification Roofs *

*Reg. U. S. Pat. Off.

THE BARRETT DIVISION
ALLIED CHEMICAL & DYE CORPORATION
40 Rector Street, New York 6, N. Y.
36th St. & Gray's Ferry Ave., Philadelphia 46, Pa.
205 W. Wacker Drive, Chicago 6, Ill.
1327 Erie Street, Birmingham 8, Alabama
In Canada: The Barrett Company, Ltd., 5551 St. Hubert St., Montreal, P. Q.

He starts by asking, "Are You Mr. So-and-So?" Before you can blink your eye, he slaps you with a subpoena and suddenly you are the defendant in a negligence suit. Somebody fell on the slippery floor of your building and is suing you for a king's ransom.

The Legge System of Safety Floor Maintenance makes slippery floor hazards unnecessary. The secret and exclusive formulas of Legge safety floor cleaners and polishes give *shine-without-slipperiness* to the floors of buildings, plants and institutions. The Legge System imparts a durable gloss which nevertheless has *maximum slip-resistance.*

Nothing is left to chance. Legge Safety Engineers conduct an on-the-spot examination of your floors. They check the composition, condition and daily traffic before recommending the *correct* materials for your needs. Moreover, they instruct and supervise your crews in the efficient use of these products. This service is provided *without extra cost.*

Perhaps you have been fortunate thus far in escaping costly negligence suits. But how about the *condition* of your floors? How about their *appearance?*

In the past, the Legge System has performed seeming miracles in restoring floors that were ready to be scrapped. But there's a limit even to Legge ingenuity. It's wise to call us *before* inferior products and old-fashioned maintenance methods damage your floors beyond rehabilitation.

If you have a sensible regard for the value of your property, simply clip the coupon and mail today for a revealing booklet on scientific floor care. It's free and there's no obligation whatever. Better do it now, please. WALTER G. LEGGE COMPANY, INC., New York 17, N. Y. Branch offices in principal cities. In Toronto—J. W. TURNER CO.

YOU'RE SAFE WHEN YOU HAVE LEGGE TO STAND ON

LEGGE SYSTEM
of Safety Floor Maintenance

Walter G. Legge Co. Inc.
101 Park Ave., New York 17, N.Y.
Please send me a free, no-obligation copy of your Mr. Higby book.
Signed_____
Title_____
Types of flooring_____
Area_____sq. ft. A-3

Copyright 1951

WHAT'S NEW IN EQUIPMENT

Begins on page 136

PLANT HOUSEKEEPING

Three-in-One Cleaner

With Blo-R-Vac you have a vacuum cleaner, water pickup, and sprayer, all in one unit. You can use it as a tank cleaner to pick up dust, dirt, and metal particles—or to remove excess water from floors after mopping. When removed from the tank, the power unit becomes a hand-type cleaner or blower. It's handy in blowing dirt out of hard-to-get-at places. A spray attachment converts it into a sprayer for paints, etc.

Ideal Industries, Inc., 1416 Park Ave., Sycamore, Ill.

Explosion-Proof Floor Machine

This floor machine may help pay for itself in lower insurance rates. It's explosion-proof—designed for plant housekeeping in factories with explosive atmospheres. The Holt Commander sands, waxes, polishes, scrubs, wire-brushes, steel-wools, and grinds floors.

Flames or sparks can't escape to set off gas, dust, or vapors. Design of outside moving parts eliminates external sparks caused by static electricity. Safety-tested metal enclosures are all explosion-proof. Bears Underwriters Approved Seal of Safety.

Holt Mfg. Co., 651 20th St., Oakland 12, Calif.

More on next page

HALLOWELL

Why SHOP EQUIPMENT OF STEEL

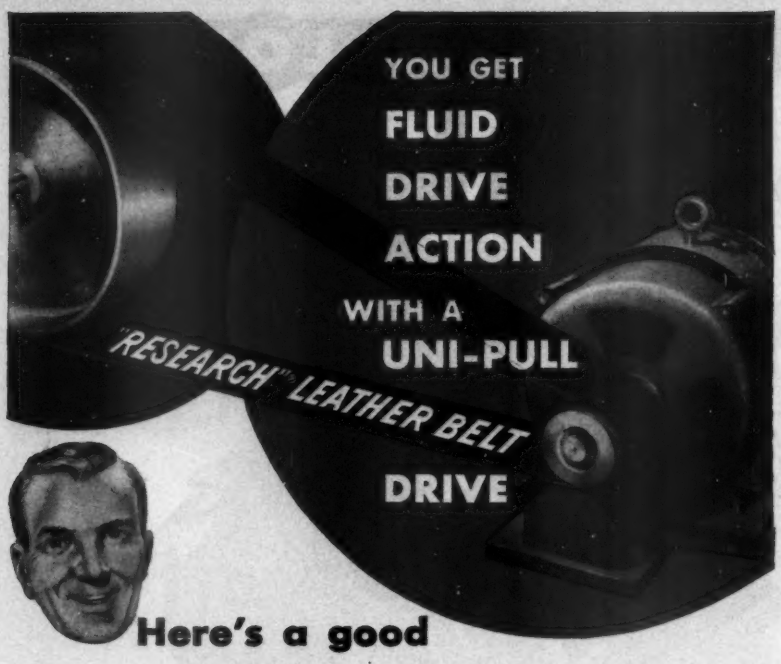
. . . giving productivity a lift

Stepped-up productivity is vital to our stepped-up national requirements.

Modern materials handling methods are one of the means we've used to give our own productivity a lift . . . so we can make *more* HALLOWELL Steel Stools to seat *more* workers to make *more* parts for *more* ships, *more* planes, *more* tanks, *more* guns and all the thousands of other things our armed forces so urgently need . . .

SPS STANDARD PRESSED STEEL CO.

JENKINTOWN 11, PENNSYLVANIA



Here's a good example of Graton & Knight *Engineered* Flat Leather Belting

Success of your short center pivoted motor base drives depends on the FLUID DRIVE ACTION of the belts you use. They should possess these five quality features:

1. *High Coefficient of Friction* — to grip *across and around* the pulleys.
2. *Flexibility* — to withstand continuous flexing on short centers over small diameter pulleys.
3. *Resiliency*—to absorb starting torque and load shock.
4. *Minimum Permanent Stretch* — to maintain correct tension at all times.
5. *Great Tensile Strength* — to carry peak loads.

These five quality features describe RESEARCH, the premium quality flat leather belt made by a special process to give you FLUID DRIVE ACTION on Uni-Pull and other important drives. It is one example of G&K Leather Belting *engineered* to give more production-power.

Other famous G&K brands, developed through a century of service to industry, include HEART OAK, a rugged, firm belt for shifters and step-cone pulleys; and SPARTAN,® a combination tan resistant to oil, steam, acid and alkali fumes . . .

Let the G&K man help you *"drive it better with leather."*

GRATON & KNIGHT COMPANY
Worcester, Massachusetts

To assist you in engineering a short center drive, be sure to get a free copy of the new Uni-Pull Drive Manual. Write for it on your letterhead.

PREMIUM RESEARCH QUALITY

HEART OAK

SPARTAN®

100 YEARS OF SERVICE TO INDUSTRY

YOU CAN DRIVE IT BETTER WITH LEATHER*

GRATON AND KNIGHT® *Engineered* LEATHER BELTING

Begins on page 136

SAFETY & PLANT PROTECTION

On-Off Foam Fire Extinguisher

The new Aer-O-Foamster gets the most out of its foam charge in fighting oil or gasoline fires. A trigger valve switches from water to foam spray or back again without shutting the unit down. Your fire fighters can conserve foam while shifting position, then open up again on the fire.

Foamster stands less than 2 feet high, weighs only 26 pounds with charge. It fits a 1-in. booster water hose. One man can easily carry and operate it. Foamster will deliver 540 gallons of foam at a range of 50 feet. Comes for storage in freezing locations. Yearly recharging isn't necessary.

National Foam System, Inc., West Chester, Pa.

Portable Gas Analyzer

The Lor-Ann gas analyzer is explosion-proof, weighs 6 pounds complete. Your watchmen or safety engineers will find it handy to carry on their rounds to check for explosive and flammable gases. In addition to on-off switch, only two controls—voltage check and zero adjust—are used to obtain a reading.

Lor-Ann Instrument Co., Jersey City, N. J.

Safety Glasses for Light Sensitive Eyes

The Soft-Lite HT-51 glass lens tones down all visible light rays evenly. It will protect sensitive eyes from extremes in plant lighting. Soft-Lite glass, when hardened to approved specifications, is said to surpass safety requirements of U. S. Bureau of Standards. The flesh-colored lenses are available for dress as well as safety wear.

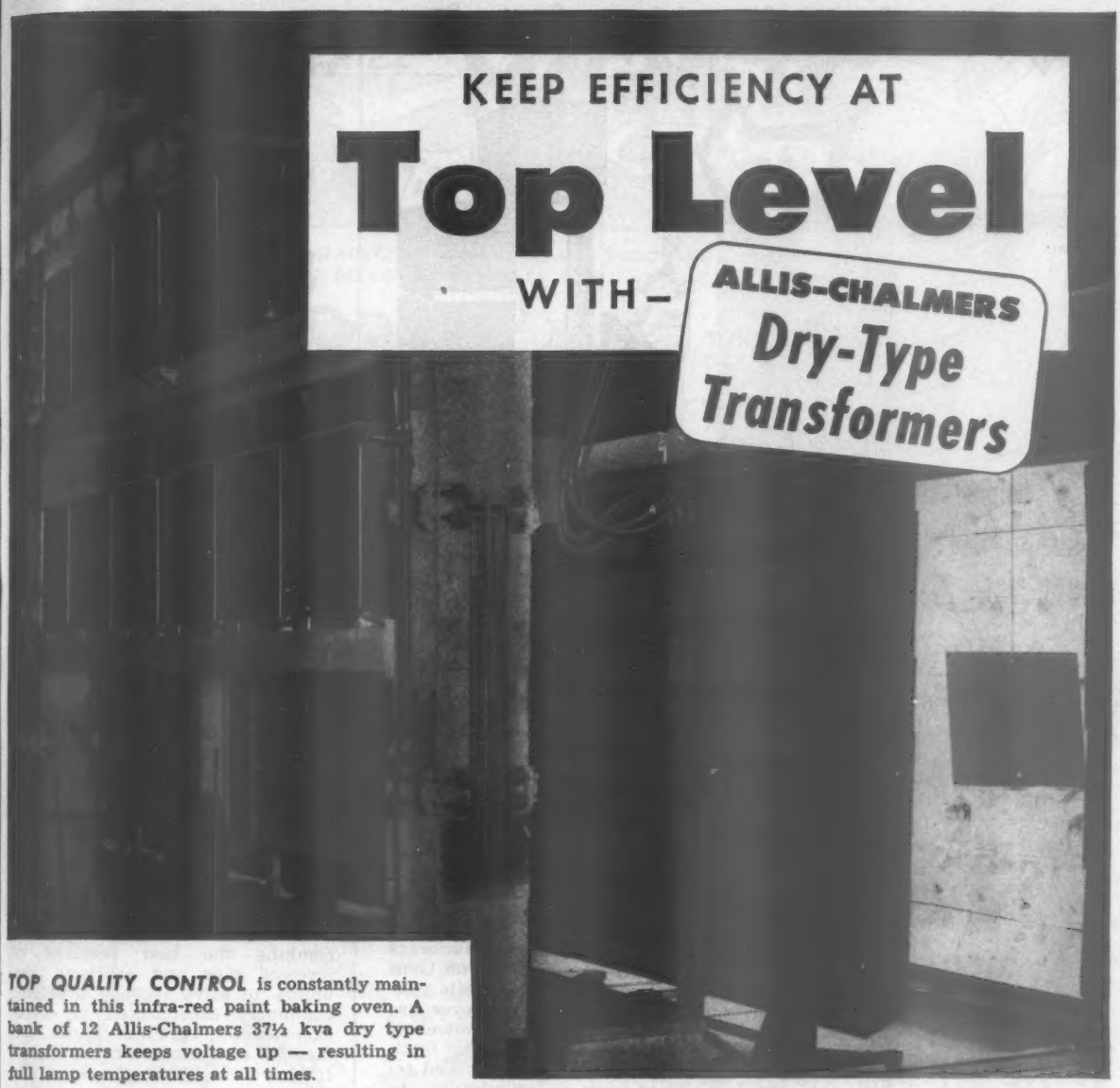
Bausch & Lomb Optical Co., 635 St. Paul St., Rochester 2, New York.

More on next page

KEEP EFFICIENCY AT

Top Level

WITH — ALLIS-CHALMERS Dry-Type Transformers



TOP QUALITY CONTROL is constantly maintained in this infra-red paint baking oven. A bank of 12 Allis-Chalmers 37½ kva dry type transformers keeps voltage up — resulting in full lamp temperatures at all times.

ALLIS-CHALMERS DRY TYPE TRANSFORMERS REDUCE POWER COSTS . . . BOOST PRODUCTION OUTPUT

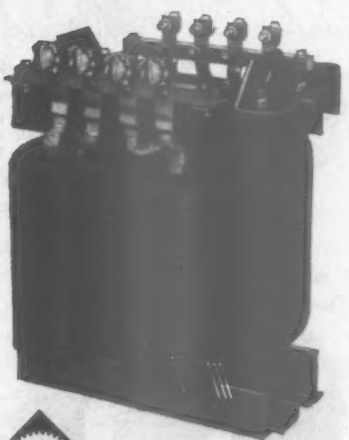
BELOW NORMAL voltages cost money! At 90% voltage you get only 70% of the light you pay for, only 80% of the motor torque, and only 78% efficiency in heating operations.

You can correct these low voltages by spotting Allis-Chalmers dry type transformers at load centers. They shorten secondary runs, reducing the amount of hard-to-get copper. They improve lighting, motor and thermal efficiency. They let you use all the power you buy.

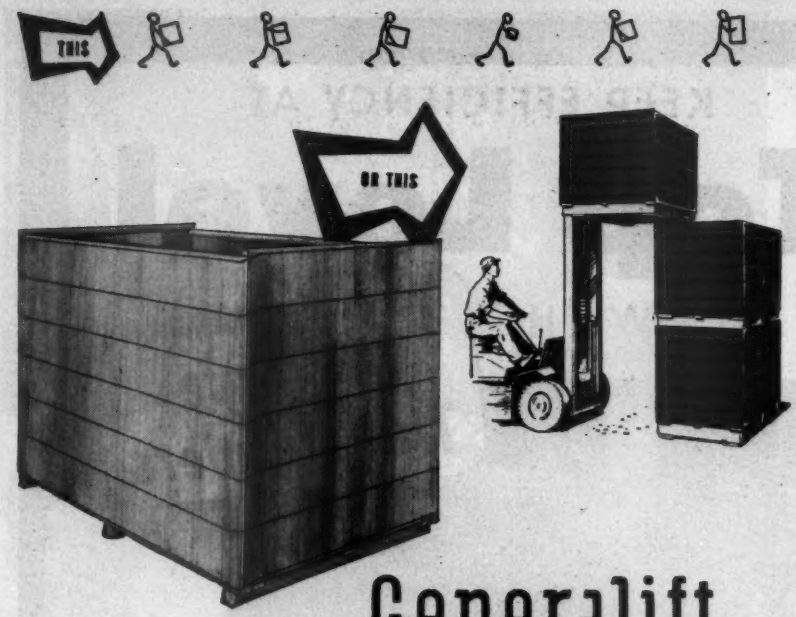
Transformers are stocked country-wide in popular ratings. For information and bulletin 61B6382A contact your nearby Allis-Chalmers dealer or sales office or write Allis-Chalmers, Milwaukee 1, Wisconsin.

Time saving solderless connectors are standard on units 15 through 50 kva, single phase, and 37½ through 100 kva, three phase.

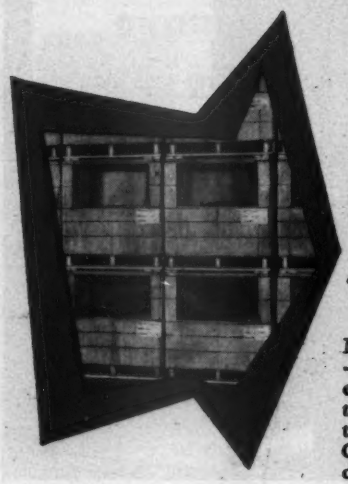
A-3305



ALLIS-CHALMERS



Generalift
★ ★ ★ ★ ★
pallet boxes



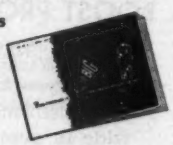
1 CUT MATERIALS HANDLING COSTS

2 SHARPLY REDUCE STORAGE COSTS

More and more cost-minded manufacturers —the country over—are saving with Generalift Pallet Boxes. These versatile containers sharply reduce costs wherever materials are handled or stored. Remember, Generalift Pallet Boxes and fork-lift truck do the work of many employees. And remember also to write us for complete information. Why not do it NOW?

WE WILL MAIL FREE COPY OF "THE GENERAL BOX"

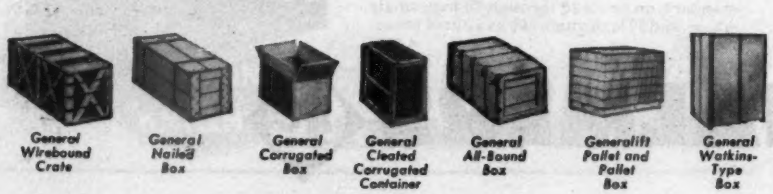
This colorful booklet illustrates and describes the many advantages of the Generalift Pallet Box. We will be glad to mail upon request.



ALL TYPES OF ENGINEERED SHIPPING CONTAINERS

DISTRICT OFFICES AND PLANTS: Cincinnati, Denville, N. J., Detroit, East St. Louis, Kansas City, Louisville, Milwaukee, Sheboygan, Winchendon, Continental Box Company, Inc.: Houston, Dallas. General Box Company of Mississippi, Meridian, Miss.

General BOX COMPANY
engineered shipping containers
★ ★ ★ ★ ★
GENERAL OFFICES: 504 N. Dearborn St., Chicago 10, Ill.

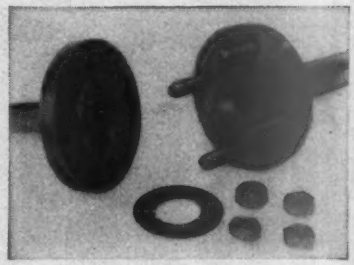


General Wirebound Crate | General Nailed Box | General Corrugated Box | General Cleated Corrugated Container | General All-Round Box | Generalift Pallet and Pallet Box | General Watkins-Type Box

WHAT'S NEW IN EQUIPMENT

Begins on page 136

VALVES, PIPING & ACCESSORIES



Corrosion-Resistant Alloy Fittings

The makers claim simplified installation and cost reduction as the advantages of three speedline fittings. Their insert flange (above) uses a corrosion-resistant serrated insert in a carbon steel flange. Relatively little high alloy material is used. Installation time is said to be reduced. There's no welding, vanstoning, and threading. Only tools required are an expander and a plain wrench.

The Speedline union is said to combine the best features of screwed pipe and sanitary tube unions to solve leakage problems commonly encountered in corrosion-resistant ground joints. Bimetallic construction makes it gall-free. A third fitting, the Speedline aligning connector, makes heavy-wall to light-wall connections.

Horace T. Potts Co., Erie Ave. & D St., Philadelphia 34.

Anti-Corrosion Tubing

Two lines of alloy tubing and pipe will handle a variety of oxidizing and reducing corrodents. Carpenter Alloy B has high resistance to hydrochloric acid—all concentrations at any temperature —and sulphuric acid—at temperatures above 80 degrees C.

Carpenter Alloy C, with a chromium content, withstands the strong oxidizing conditions encountered in nitric acid and free chlorine. It's also tough enough to handle phosphoric, acetic, formic, and sulphuric acids.

The Carpenter Steel Co., Alloy Tube Div., Union, N. J.

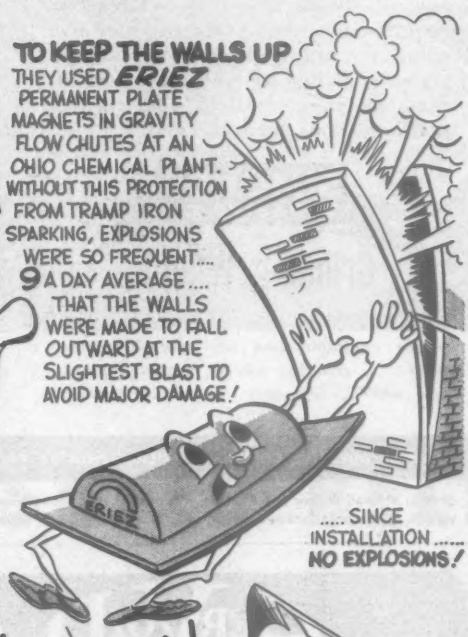
More on next page

ERIEZ MAGNETIC ATTRACTIONS

ERIEZ MANUFACTURING CO, ERIE, PA., U.S.A. • PRODUCERS OF MAGNETIC SEPARATORS AND SELLERS OF (RCA) ELECTRONIC METAL DETECTORS

IT'S A FACT...734,254 BEEF LIVERS AND 5956 CARCASSES WERE CONDEMNED IN A YEAR BECAUSE OF ABSCESS AND PERICARDITIS CAUSED BY ***TRAMP IRON*** IN CATTLE FEED LOSS...OVER 3 MILLION DOLLARS! ***ERIEZ*** **ATOM**AGNETS FIGHT THIS BECAUSE THEY WON'T LET TRAMP IRON PASS.

TO KEEP THE WALLS UP THEY USED ***ERIEZ*** PERMANENT PLATE MAGNETS IN GRAVITY FLOW CHUTES AT AN OHIO CHEMICAL PLANT. WITHOUT THIS PROTECTION FROM TRAMP IRON SPARKING, EXPLOSIONS WERE SO FREQUENT.... 9 A DAY AVERAGE.... THAT THE WALLS WERE MADE TO FALL OUTWARD AT THE SLIGHTEST BLAST TO AVOID MAJOR DAMAGE!



..... SINCE INSTALLATION ..... **NO EXPLOSIONS!**

YOU DON'T HAVE TO BEAT THIS DRUM ...FOR RESULTS. THE ***ERIEZ*** *MAGNETIC DRUM* AUTOMATICALLY REMOVES STRAY IRON.... SOME DANGEROUS TO MACHINERY.... SOME THAT CAN BE SOLD. *USED IN EVERY INDUSTRY!*

FIVE DOLLARS SAVED A YEAR FOR EACH DOLLAR INVESTED... THE RESULT OF ***ERIEZ*** MAGNETIC HUMP SEPARATOR INSTALLATIONS AT A SOUTHERN TEXTILE PLANT...***WOODSIDE MILLS.*** AVERAGE NUMBER OF FIRES *BEFORE* ***ERIEZ*** HUMPS WERE IN....12 PER YEAR! *AFTER INSTALLATION.....* NO FIRES...NO PRODUCTION DELAYS!

RETURN THIS COUPON.

ERIEZ MANUFACTURING COMPANY
209 STATE STREET, ERIE, PA.

MY CONTAMINATION OR SEPARATION PROBLEM IS:

_____

_____

PLEASE SEND LITERATURE ☐

HAVE REPRESENTATIVE CALL ☐ PROMPTLY ☐ WHEN IN AREA

NAME _____

TITLE _____

COMPANY NAME _____

STREET _____

CITY _____ ZONE ____ STATE _____

SIC

the Methods Engineer is walking on air!

Grinding production is up and so are the methods engineer's spirits — all because he got together with a Simonds Abrasive Company engineer and discovered where he could use one wheel on a job that formerly required two. Are YOU sure you are using the most efficient wheels on your grinding operations? Let a Simonds engineer help you answer that question. Write.

SIMONDS ABRASIVE CO.

Grinding Wheels

EXECUTIVES — *Simonds Abrasive Company's complete line has everything you need . . . grinding wheels, mounted points and wheels, segments and abrasive grain.*

SIMONDS ABRASIVE COMPANY, PHILADELPHIA 37, PA. DISTRIBUTORS IN PRINCIPAL CITIES

Division of Simonds Saw and Steel Co., Fitchburg, Mass. Other Simonds Companies: Simonds Steel Mills, Lockport, N. Y., Simonds Canada Saw Co., Ltd., Montreal, Que. and Simonds Canada Abrasive Co., Ltd., Arvida, Que.

AERVOID AIDS to speeded-up industrial feeding

AerVoiD Hot Food Carriers, AerVoiD Hot Liquid Carriers, AerVoiD Mobile Canteen

Hot flavorful foods kept hot by AerVoiD high vacuum insulation for workers that cannot come to a cafeteria without too much loss of time. A hot coffee pick-up for workers at their work with AerVoiD vacuum insulated liquid carriers. Hot coffee and light refreshments serviced directly to workers at their work with the AerVoiD narrow aisle Mobile Canteen.

In peace or defense industrial feeding AerVoiDs do a job that cannot be accomplished with any other equipment . . . because AerVoiDs alone do the job of transporting and distributing of hot foods for service a distance from the kitchens where they are prepared.

WRITE TODAY

for illustrated bulletin "The Job AerVoiDs Do In Industrial Feeding" and special circular on "AerVoiDs In Defense Industrial Feeding."

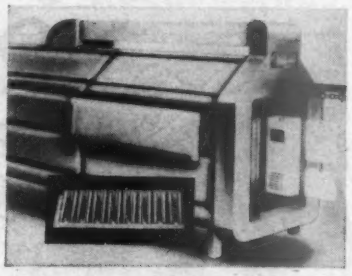
VACUUM CAN COMPANY

19 South Hoyne Avenue Chicago 12, Illinois

AERVOID *vacuum insulated*

HOT FOOD, SOUP, AND COFFEE CARRIERS

MISCELLANEOUS

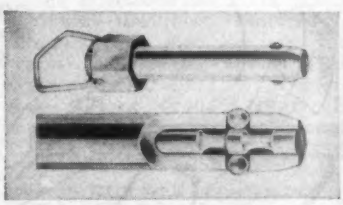


Industrial Ovens

Using electric heater panels and standardized frame members, you can field-assemble industrial ovens to size, shape, and heating capacity desired. High-speed radiant heating and temperature-controlled convection permit heating and drying operations up to 700 degrees F.

You can service the oven from the outside. Picture shows panel extended for servicing. Rod-type heaters (insert) are mounted on insulated oven sections.

Jensen Specialties, Inc., Detroit 28, Mich.



One-Piece Fastener

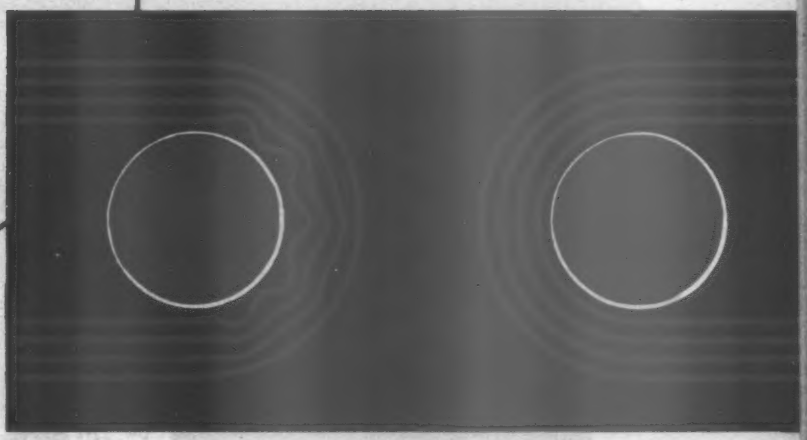
This is a quick-release, one-piece fastener called Pip pin. You use it like a bolt—but there's no additional retaining fixture. Pip pin holds itself in place. It saves you the trouble of fiddling with cotter pins and nuts in tight places.

The cutaway closeup shows how Pip pin works. A spring-loaded spindle rides inside the fastener barrel. Steel balls forced out by the large diameter of the spindle lock the pin in place. To remove, you push or pull the spring-loaded spindle. The steel balls recede into the spindle grooves flush with the outer surface.

Aviation Development Inc., 2940 N. Hollywood Way, Burbank, Calif.

More on page 352

POWER FROM EVERY PLY



Condor COMPENSATED BELT

Users tell us Compensated Belts outlast ordinary transmission belts—as much as 3 to 4 times on some drives. . . . There are sound engineering reasons for this. With our patented Compensation construction, as diagrammed on the *right* in panel above, you get more power, more belt-life, because each ply pulls an equal share of load around the pulley. . . . Longer life and trouble-free service are assured, as Compensation prevents outer ply ruptures, fastener troubles, ply separation, which often occur in regular belts as diagrammed at *left* above. Write for Bulletin 6808-J, which explains these and other features. . . . Extra long life is also engineered into R/M hose, V-belts and conveyor belts. See your R/M distributor.

MANHATTAN RUBBER DIVISION — PASSAIC, NEW JERSEY

RAYBESTOS-MANHATTAN, INC.

Manufacturers of Mechanical Rubber Products • Rubber Covered Equipment • Radiator Hose • Fan Belts • Brake Linings • Brake Blocks • Clutch Facings • Packings • Asbestos Textiles • Powdered Metal Products • Abrasive and Diamond Wheels • Bowling Balls

WESTINGHOUSE
DO NOT LUBRICATE
Life-Line motor
PAIRED FOR PRODUCTION
Life-Linestarter

Cut motor failures with these two

Don't take our word for it. Here's what users of Life-Lines say: "We always have had bearing failures on our pump motors. It was quite an expense in repair costs and down time. Since we installed Life-Line motors, we have had no down time . . . no failures. We now standardize on Life-Lines."

Another user reports: "Our former starters employed solder pot mechanisms. Much trouble was experienced. Since we've switched to Life-Linestarters,® our troubles are gone. The operation of the bimetallic disc is positive."

These reports are two of several hundred such reports resulting from the new kind of dependability built into the Life-Line motor and Life-Linestarter.

Life-Line Motors

Steel frame . . . adds strength, cuts weight.
Pre-lubricated bearings . . . no greasing.
Improved windings . . . lengthen electrical life.

Life-Linestarter

Bimetallic disc . . . calibration unaffected by aging or oxidation.
Servicing is simple . . . all parts removable. Screw driver only tool required.

Get the advantages of these two—your best bet to cut motor failures. Ask your Westinghouse representative for copies of "Life-Line Motor Book", B-3842 and "Tomorrow's Starter Today", B-4677, or write Westinghouse Electric Corporation, P. O. Box 868, Pittsburgh 30, Pennsylvania. J-21644

YOU CAN BE SURE . . IF IT'S Westinghouse

Life-Line

MOTORS and CONTROLS

Man-Alive! this Hydraulic Jack

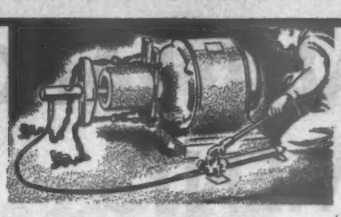
DOES EVERYTHING

but walk and talk!

It's a "Porto-Power" Jack! It's remotely controlled . . . it's all directional . . . and it can do "1001" tough jobs. You'll be positively amazed at the time, trouble and money it saves!

LIFT

Lift from a low of 1½". Save up to 9 hours or more in moving and re-settling a machine with this "Porto-Power" toe-lift setup.

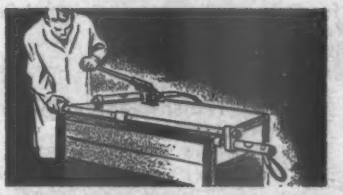


PULL

Standard attachments quickly harness the ram to pull with FULL power. Pull wheels, gears, pulleys — no prying or sledging.

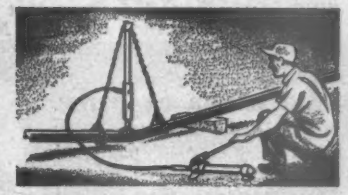
PRESS

Mount the "Porto-Power" ram in a home-made press or a standard "Porto-Power" bench press. Ram is easily removed.



CLAMP

Clamp parts for welding, riveting or other operations. Combinations build up for short or long spans.



BEND

Bend monorail, straighten shafts — apply hydraulic power how, where and when you want it!

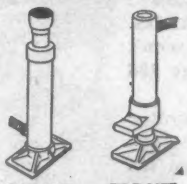
PUSH

Push out pins, bushings, etc., with this or other versatile "Porto-Power" combinations.

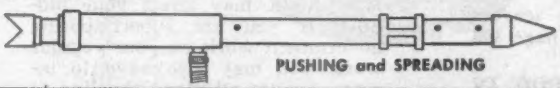
Here are just a few of the many "Porto-Power" COMBINATIONS

Standard attachments and the ram are threaded for easy, fast assembly.

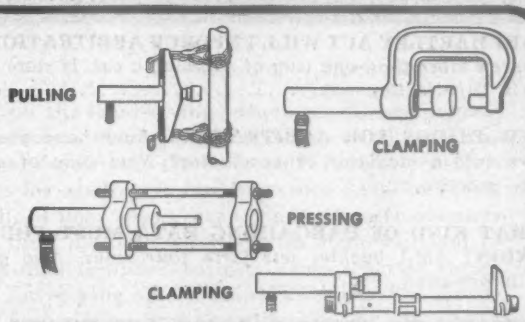
A sturdy high-pressure safety hose connects the ram to the portable hydraulic pump.



TOP-LIFT TOE-LIFT



PUSHING and SPREADING



PULLING CLAMPING PRESSING CLAMPING

"Porto-Power" eliminates all this . . . conserves valuable manpower!

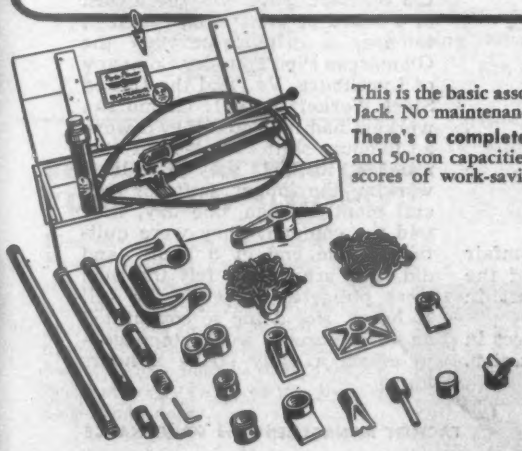
OUT goes dangerous blocking up.

OUT go inconvenient, time-taking operations.

OUT goes damaging hammering and prying.

OUT goes excessive use of heat.

OUT go costly and varied mechanical devices.



Every plant needs the S31 KIT

This is the basic assortment of "Porto-Power" attachments and the 10-ton "Porto-Power" Hydraulic Jack. No maintenance crew can afford to be without it! It pays for itself on one or a few good jobs.

There's a complete line of "Porto-Power" equipment! Rams are available in 2, 4, 7, 10, 20 and 50-ton capacities and a range of sizes . . . with hand-operated or motor-driven pumps . . . plus scores of work-saving attachments for maintenance, production or laboratory work.

Write Blackhawk or see your industrial supply dealer.
Blackhawk Mfg. Co., Dept. J-2731, Milwaukee 1, Wis.

Porto-Power

is the exclusive (trade name registered) product of

BLACKHAWK

SIGNIFICANT LABOR DEVELOPMENTS

. . . told in brief for busy factory executives

By **PAUL A. KING**, *Assistant to Vice President for Personnel, Bigelow-Sanford Carpet Company, Inc. Member, New York Bar.*

UNION ORGANIZER COMMITS UNFAIR LABOR PRACTICE. *It happens all the time. But this time a Federal court bears down* ..... **page 194**

CHECK WALSH-HEALEY WAGE MINIMUMS FOR WAR WORK. *Labor costs for work on government contracts may be higher* ..... **page 194**

REFUSAL TO WORK OVERTIME VIOLATES NO-STRIKE CLAUSE. *Once employees agree to work overtime they must stick to it, rules arbitrator* ..... **page 194**

TAFT-HARTLEY ACT WILL ENFORCE ARBITRATION AWARDS. *There's more than one way of skinning a cat. If state courts won't do it, Taft-Hartley may* ..... **page 196**

NEW ETHICS FOR ARBITRATORS. *Ever have your arbitrator turn into a mediator or conciliator? New code of ethics taboos this practice* ..... **page 196**

WHAT KIND OF BARGAINING DATA MUST YOU GIVE THE UNION? *AMA booklet sets forth four rules. Also gives sources of information* ..... **page 198**

PERSONALITY TESTS FOR JOB APPLICANTS TABOO IN FEPC STATES. *Employers using tests that ask job applicants about religion violate law* ..... **page 198**

ARBITRATOR UPSETS PREDECESSOR'S RULING. *If arbitrators do this consistently, no arbitration award will settle anything* ..... **page 200**

TIME STUDY MEN INCLUDED IN CLERICAL BARGAINING UNIT—*These time study men were not considered professionals, did not exercise independent judgment* ..... **page 200**

BRIEF—BUT IMPORTANT: *Who's tougher—CIO or AFL?. . . . . Pension plans cover more than 5-million workers. . . . Term, open-end contracts covered by Walsh-Healey. . . . . How will the Commies behave in the months ahead? . . . . Child labor law explained. . . . . World War II dispute settlement book* ..... **page 202**

Union Organizer Commits Unfair Labor Practice

"Those who do not join the union will lose their jobs." "We have ways of handling people like you that argue against the union."

These words, uttered by an ILGWU organizer to an employee who wasn't anxious to sign up with the union, constituted an unfair labor practice on the part of the union, ruled a Federal court in Denver.

It tended to coerce employees in their right not to join a union. (*Seamprufe, CCA*)

Check Walsh-Healey Minimums for War Work

Taking on war work? If your contract with the government is for $10,000 or more, you come under the Walsh-Healey Law (Public Contracts Act). This means that you have a different wage-hour law to worry about. Walsh-Healey differs from the Fair Labor Standards Act (the Wage and Hour Law that you have been complying with all along). Compliance with one doesn't mean that you will always comply with the other.

From a dollar-and-cents point of view there is also a big difference between the two laws. Walsh-Healey minimums—which are set for each industry or segment — are often substantially higher than the 75-cent Wage-Hour minimum. They'll affect your labor costs, may affect your bidding. If you are superimposing government work on your regular work, you may also have to increase wages all along the line to keep your differentials.

If you're taking on war work, check Walsh-Healey for wage minimums, and other provisions.

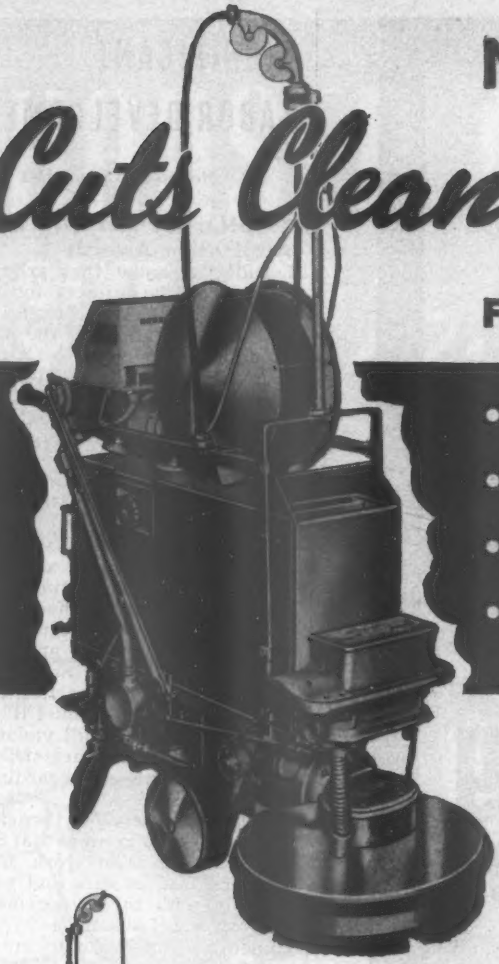
Refusal to Work Overtime Violates No-Strike Clause

Once employees agree to work overtime, their later refusal to do so violates the no-strike clause of the contract. That was the award of a board of arbitration called in to hear a dispute between the Glamorgan Pipe Foundry Company of Lynchburg, Va., and the United Steel Workers (CIO). Glamorgan workers had indicated they'd work a 10-hour shift, instead of the usual 8. In fact, they had been working the longer shift for several months. Then, one day, they told the company they were quitting at the end of 8 hours—and did. The arbitrators felt the men were obligated to work the full 10 hours. Not doing so constituted an unauthorized work stoppage—in effect, a daily strike 2 hours long.

NEW SCRUBBER-VAC

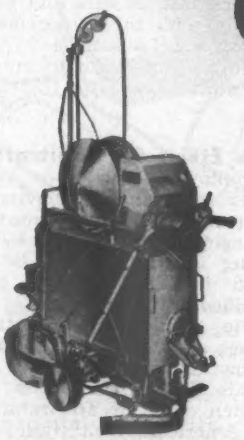
Cuts Cleaning Time 2/3

FOR SMALL-AREA FACTORIES



- Specially designed for buildings with 2,000 to 15,000 sq. ft. of floor space
- Applies the cleanser, scrubs, rinses, and picks up in ONE operation
- Also handles the dry work — steel-wooling, polishing, et cetera
- Can be leased or purchased (leasing budgets cleaning expense)

Now the labor-saving advantages of *combination-machine-scrubbing* are available to small as well as larger factories. The *new 418P Finnell Scrubber-Vac,* for small-area buildings with 2,000 to 15,000 sq. ft. of floor space, cleans floors in *approximately one-third the time* required with a conventional 15 or 18-inch scrubber-polisher using separate equipment for picking up. A *Finnell Scrubber-Vac* speeds cleaning by handling four operations in one! It applies the cleanser, scrubs, rinses if required, and picks up (damp-dries the floor) — all in a single operation.



Of narrow design, the *new 418P Scrubber-Vac* also meets the need in larger factories for a combination machine that can be used in congested areas and narrow aisles. And all the refinements of *Finnell's* larger combination machines are embodied in this smaller unit (18-inch brush ring). Has new type of water valve that *assures* uniform flow of water . . . powerful vacuum for efficient pickup (performs *quietly*) . . . a *Finnell-developed* trouble-free clutch . . . self-winding cable reel . . . improved waterproof wiring and minimum electrical connections, simplifying the cleaning of the machine . . . G. E. Motors and Timken Bearings. The machine is self-propelled—operator merely *guides* it. Supplied with or without powder dispenser. Incidentally, it's good to know that when you choose *Finnell Equipment,* a *Finnell* man is readily available to help train your maintenance operators in its proper use.

SEE IT IN ACTION ON YOUR OWN FLOORS!

Find out what *you* would save with a *Finnell Scrubber-Vac. Finnell* makes several models and sizes. For demonstration, consultation, or literature, phone or write nearest *Finnell Branch* or Finnell System, Inc., 2503 East Street, Elkhart, Indiana. Branch Offices in all principal cities of the United States and Canada.

FINNELL SYSTEM, INC.

Pioneers and Specialists in

FLOOR-MAINTENANCE EQUIPMENT AND SUPPLIES

BRANCHES IN ALL PRINCIPAL CITIES

"We can carry twice as many passengers now that we have our ceilings covered with slip-resistant 4-WAY Safety Plate."

For greater safety under foot, in your plant and on your products

Inland 4-Way® Safety Plate

Easy Assembly

Safe Footing

More Traction

Adds Strength

INLAND

INLAND STEEL COMPANY, Dept., FMM-31
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Sales Offices: Chicago, Davenport, Detroit, Indianapolis, Kansas City, Milwaukee, New York, St. Louis and St. Paul.

New Bulletin with New Ideas—Just Out! Bulletin FI. Complete engineering and application data. Send for it!

STOCKED BY LEADING STEEL WAREHOUSES

SIGNIFICANT LABOR DEVELOPMENTS

Begins on page 194

Taft-Hartley Act Will Enforce Arbitration Awards

Did you know that arbitration awards will be enforced by federal courts, irrespective of any state law on arbitration, or the absence of any state law?

A federal District Court has just issued a preliminary injunction ordering a Southern textile mill to carry out the award of an arbitrator. Enforcement of arbitration awards comes under Section 301 (a) of the Taft-Hartley Act. The section says:

"Suits for violation of contracts between an employer and a labor organization representing employees in an industry affecting commerce as defined in this Act . . . may be brought in any district court of the United States having jurisdiction of the parties. . . ."

The arbitrator, Samuel H. Jaffee, had held that the mill violated the contract by taking back strikers on its own terms—disregarding the contract.

Although the union benefited in this case, keep in mind that Section 301 (a) can also work for employers. But, be sure that you also comply with the requirements of the Norris-LaGuardia (Anti-Injunction) Act if it's an injunction you want. *(Aleo Mfg., USDC, N.C.)*

New Ethics for Arbitrators

Employers who have had the bitter experience of having their arbitrations turned into mediations or negotiated settlements by peace-loving arbitrators will be interested in this rule of conduct specified for arbitrators:

"He should not undertake to induce a settlement of the dispute against the wishes of either party."

This rule is part of a newly-written code for arbitrators from the American Arbitration Association, the National Academy of Arbitrators, and the government's Federal Mediation and Conciliation Service.

The code—almost two years in the making—covers such items as fee arrangements, handling of witnesses, introduction of irrelevant matters, and adoption of controversial attitudes toward witnesses and parties.

If you want a copy, write the American Arbitration Association, Time and Life Building, Rockefeller Center, N.Y. No charge.

More on next page

HANSEN COUPLINGS

GIVE YOU 2 Big Advantages

1. QUICK CONNECTION AND DISCONNECTION

2. INSTANT AUTOMATIC FLOW OR SHUT-OFF

With Hansen couplings you save precious minutes every time you connect or disconnect a fluid line carrying gas, liquid or grease.

To connect, you merely push plug into socket—flow starts instantly. To disconnect, pull back sleeve on socket, coupling disconnects. Flow is shut off instantly and automatically.

From a wide range of available sizes and types, you can select a Hansen coupling exactly suitable for your application—each type engineered to meet its specific requirements.

WRITE FOR CATALOG

QUICK-CONNECTIVE COUPLINGS for AIR ACETYLENE • OIL • GREASES • GASES VACUUM • STEAM • OXYGEN • HYDRAULIC

REPRESENTATIVES

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QUICK CONNECTIVE FLUID LINE COUPLINGS...

THE HANSEN MANUFACTURING COMPANY

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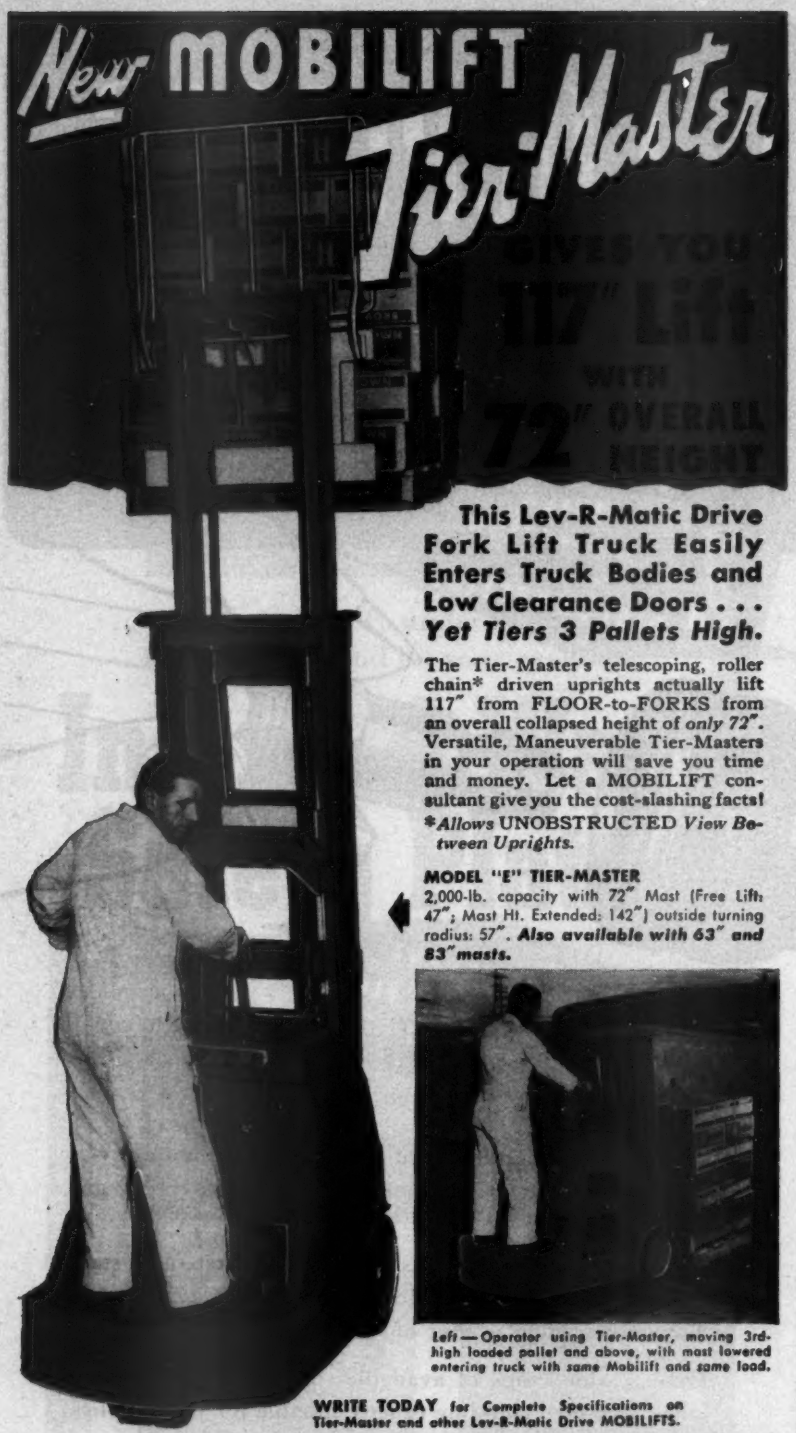


This Lev-R-Matic Drive Fork Lift Truck Easily Enters Truck Bodies and Low Clearance Doors . . . *Yet Tiers 3 Pallets High.*

The Tier-Master's telescoping, roller chain* driven uprights actually lift 117" from FLOOR-to-FORKS from an overall collapsed height of *only 72"*. Versatile, Maneuverable Tier-Masters in your operation will save you time and money. Let a MOBILIFT consultant give you the cost-slashing facts!

**Allows* UNOBSTRUCTED *View Between Uprights.*

MODEL "E" TIER-MASTER
2,000-lb. capacity with 72" Mast (Free Lift: 47"; Mast Ht. Extended: 142") outside turning radius: 57". ***Also available with 63" and 83" masts.***

Left — Operator using Tier-Master, moving 3rd-high loaded pallet and above, with mast lowered entering truck with *same* Mobilift and *same* load.

WRITE TODAY for Complete Specifications on Tier-Master and other Lev-R-Matic Drive MOBILIFTS.

MOBILIFT Lev-R-Matic DRIVE

MOBILIFT CORPORATION

835 S. E. MAIN ST., PORTLAND 14, OREGON

SIGNIFICANT LABOR DEVELOPMENTS

Begins on page 194

What Kind of Bargaining Data Must You Give the Union?

Ernest Dale, author of *Sources of Economic Information for Collective Bargaining*, advises giving the union that which:

1. Must be disclosed because of NLRB rulings.
2. Can be obtained anyway.
3. Will aid in advancing the mutual objectives of labor and management or help in reducing or reconciling a difference of objectives.
4. Will support the company's desire for an appreciation of its problems, or aid labor in the proper exercise of its functions.

Author Dale explores these four points at length in one chapter of that book. In other chapters he discusses the sources of cost of living data, productivity and its use in collective bargaining, the best utilization of wage surveys and other matters every negotiator should become acquainted with before going into a bargaining session.

The book is available to the general public at $3.75 ($2.50 to AMA members) from the American Management Association, 330 W. 42nd St., New York.

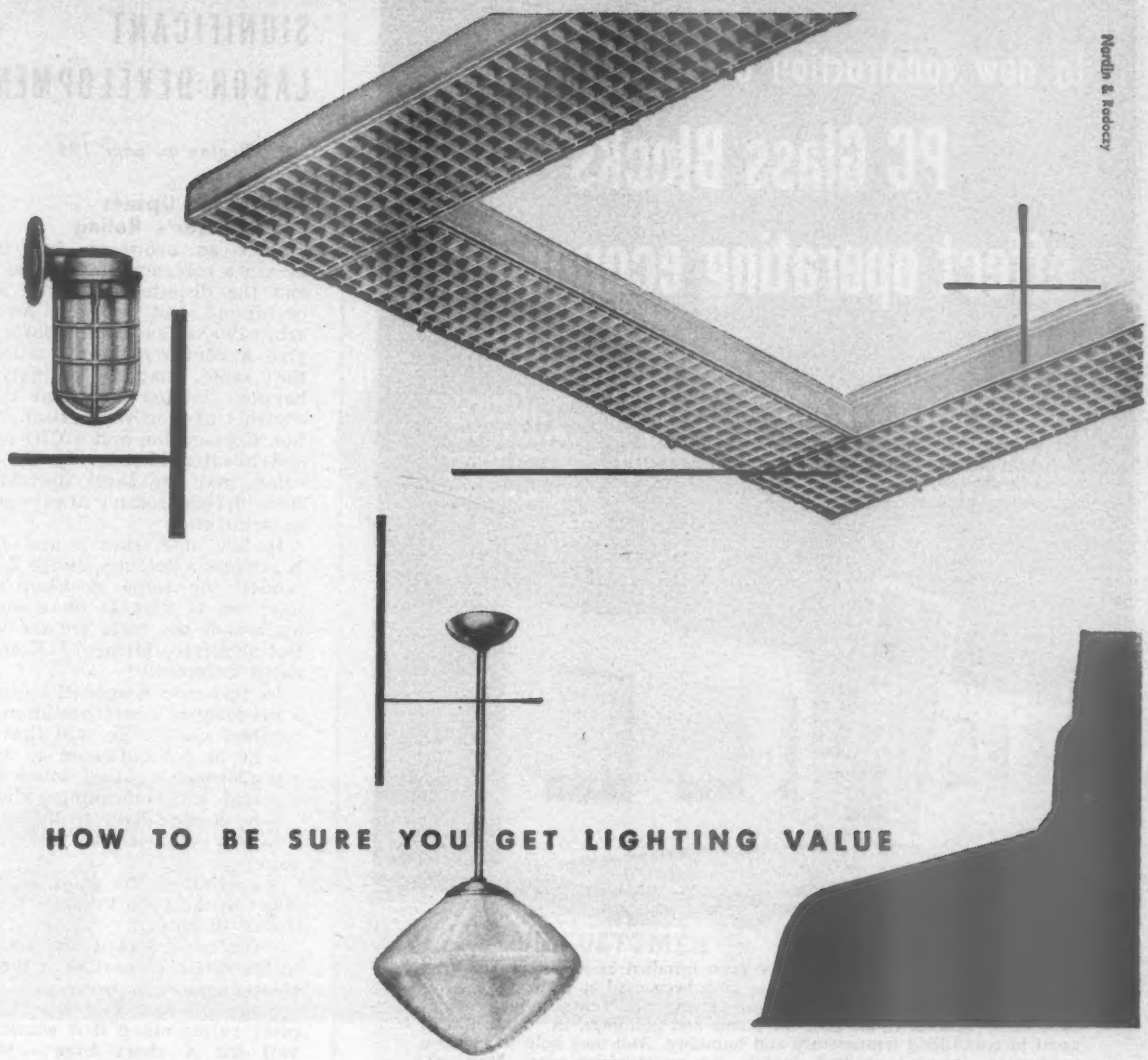
Personality Tests for Job Applicants Taboo in FEPC States

Some employers have been using personality tests as pre-employment tests to weed out unsuitable applicants. Some of these tests call for information about the applicant's religion or national origin. This information is taboo in states that have anti-discrimination laws.

One state is already on the tail of several companies using these tests for such "unlawful" purposes —despite the fact that the questions were not intended to be discriminatory.

The Psychological Corporation, New York, warns users of the tests it designs or sells that they should study the tests they are using to be sure they comply with state laws. Also that simply crossing out illegal questions isn't the answer. Tests are carefully "standardized" as a whole. Knocking out questions may change the meaning of the test scores.

More on next page



Nordin & Radocy

HOW TO BE SURE YOU GET LIGHTING VALUE

Make sure of the answer to two questions:
What will it do for me? And — what will it cost?
Here are Miller's answers to both.

Miller lighting equipment — Fluorescent, Incandescent, and Mercury-vapor, covering a wide range of industrial and commercial requirements — will give you high lighting efficiency, and years of service.

It is built on an 8-Point QUALITY standard, with rigid "Truss" construction, certified components, Bonderite-treated steel, and long-life finishes.

Three elements must be considered in figuring cost — first cost, installation cost, maintenance cost — overall cost.

Miller lighting equipment has engineering features which make for easy installation and maintenance, which explain its LOW OVERALL COST.

You can light with confidence the *proven* Miller way.

Miller field engineers and distributors are conveniently located for nation-wide service.

THE miller COMPANY MERIDEN, CONN.
SINCE 1844

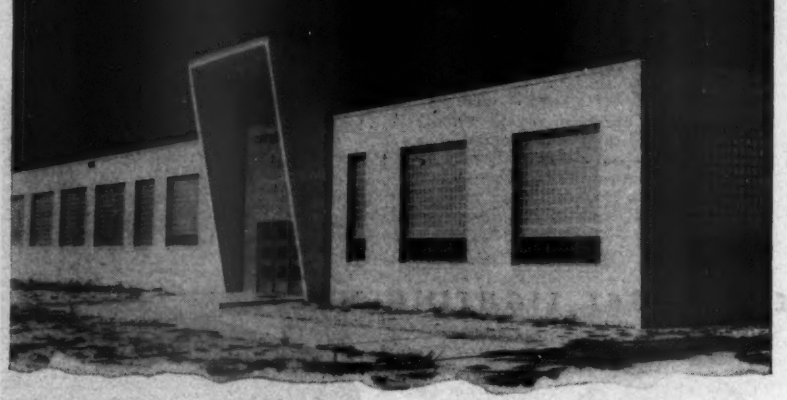
ILLUMINATING DIVISION: Fluorescent, Incandescent, Mercury Lighting Equipment
HEATING PRODUCTS DIVISION: Domestic Oil Burners and Liquid Fuel Devices
ROLLING MILL DIVISION: Phosphor Bronze and Brass in Sheets, Strips and Rolls

In new construction or modernization—

PC Glass Blocks effect operating economies

IN THIS NEW building of Pinecrest Cotton Mills, Inc., Pine Bluff, Arkansas, PC Soft-Lite* Prism Glass Blocks were adopted as an integral part of the building's architecture. They provide abundant daylighting, softly diffused for employee eye comfort; their high insulating value contributes to efficient temperature and humidity control, so essential in a textile mill. Architects: Hardy & Shumacher, Kansas City, Mo.

*T. M. Reg. Applied for.



● Whenever PC Glass Blocks have been installed as an integral part of a new building's design, or when they have been used in extensive sash replacement programs, sizable operating benefits and actual money-savings have been realized. In all kinds of plants and buildings, PC Glass Blocks assist in controlling temperature and humidity. And they help to increase production, improve product quality, cut maintenance costs, keep employees better satisfied.

PC Glass Blocks seldom require repairs or replacements. There's no wood or metal sash to rust, corrode, rot or decay; no need for periodic painting and puttying. Cleaning costs are markedly reduced, since there are no small, individual panes to wash. Normal rainfall and routine maintenance preserve their high light reflectance. Besides, PC Glass Blocks reduce heating and air-conditioning costs. That's because they have more than twice the insulating value of ordinary single glazing. And they guard against the infiltration of dust and dirt; admit floods of diffused natural daylight over wide working areas.

Why not investigate what PC Glass Blocks can do in your plants and buildings? Our specialists will be glad to help you with your new-building or sash modernization programs. Meanwhile, fill in and return the coupon for our free literature on the use of PC Glass Blocks in industrial and commercial buildings.

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Dept. P-31, 307 Fourth Avenue
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Without obligation on my part, please send me a FREE copy of your booklet on the use of PC Glass Blocks in industrial and commercial buildings.

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PITTSBURGH PC CORNING GLASS BLOCKS

The mark of a modern building

Distributed by Pittsburgh Plate Glass Company; by W. P. Fuller & Co. on the Pacific Coast, and by Hobbs Glass Ltd. in Canada.

SIGNIFICANT LABOR DEVELOPMENTS

Begins on page 194

Arbitrator Upsets Predecessor's Ruling

Once an arbitrator has interpreted a contract clause, does that end the dispute, settle the interpretation? Not at all! Another arbitrator, a few months later, can give a contrary interpretation of the same clause. Unlikely to happen? It just happened to the contract of North American Aviation Corporation and a CIO union.

Arbitrator Michael I. Komaroff ruled that the legal doctrine of *stare decisis* doesn't always apply to arbitration.

In law, if A sues B and Judge X renders a decision, Judge Z must render the same decision when later on C sues D on a similar matter—if the facts are the same. But arbitrator Michael I. Komaroff ruled differently.

In this case Komaroff overruled a predecessor's interpretation of a contract clause. He said that:

—he is not obligated to follow a predecessor's ruling unless it has a sound and continuing validity;

—he doesn't have to follow it if it doesn't reasonably resolve the issue;

—continuing the prior award in effect would open the door to additional disputes;

—the prior award was contrary to the intent of parties at the contract negotiation sessions.

Komaroff said that he'd let the prior ruling stand if it would prevail for a short time — but it wouldn't. The contract had been renewed for three years.

Time Study Men Included In Clerical Bargaining Unit

Under the Taft-Hartley law, the NLRB is not permitted to certify a bargaining unit if it contains both professional and nonprofessional employees—unless the majority of the professionals vote to be in the unit.

Although the Board often found that time study men were professionals, it found that those working for the Ohio Steel Foundry Co. of Lima were not professional—and could join a nonprofessional clerical bargaining unit.

The reason: These time study men were not required by their job to possess "special professional training"; they did not set rates, did not exercise much discretion or independent judgment.

More on next page

The Most Important Man in Your Business

You do everything possible to be sure that your product is designed and manufactured to please your customer.

The same care should be given your selection of a shipping container. No matter how well your product is made — if it doesn't reach your customer in good condition — all previous effort is wasted.

For years, Gaylord boxes have been protecting the products of many of the country's leading manufacturers.

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CORRUGATED AND SOLID FIBRE BOXES • FOLDING CARTONS • KRAFT BAGS AND SACKS • KRAFT PAPER AND SPECIALTIES

We don't have to 'teach' our people how to use this extinguisher!

One glance tells you just how the Randolph operates—no instructions, no explanations necessary! That's why *anybody* can get a Randolph into action fast! No valves to turn, no nozzles to adjust; just point and press your thumb and Randolph's cloud of snowy CO_2 kills fire instantly!

Non-damaging Randolph CO_2 evaporates without a trace, is non-toxic, won't conduct electricity, deteriorate or freeze. And *all* Randolph Models are Underwriters' Approved.

A COMPLETE LINE OF EXTINGUISHERS AND AUTOMATIC SYSTEMS

Learn how Randolph gives your plant panic-proof, split-second protection against flammable liquid, electrical and other hard-to-handle fires! Write Randolph Laboratories, Inc.,4 E. Kinzie St., Chicago 11, Illinois.

Randolph SIMPLIFIED FIRE EQUIPMENT

SIGNIFICANT LABOR DEVELOPMENTS

Begins on page 194

BRIEF — BUT IMPORTANT

Who's tougher—CIO or AFL? CIO unions were involved in 11 of the large work stoppages in 1950 (stoppages involving over 10,000 persons), AFL unions in 7, and unaffiliated unions in 5. The Bureau of Labor Statistics also reports that wage and pension questions were the dominant issues in more than two-thirds of these strikes.

Pension plans now cover more than 5-million workers—three times as many as two years ago, the Bureau of Labor Statistics reports. About 80% are company paid-for.

Term, open-end contracts covered by Walsh-Healey. A Public Contracts Act Examiner rules that contractors operating under "term" or "open-end" contracts are not exempt from the Walsh-Healey Act's provisions. He also ruled that contracts with the government that are performed for amounts *less* than the $10,000 limit prescribed by the law are also covered—if the contract, as drafted, contemplated purchases in excess of this amount. *(In re: Nomis, Inc.).*

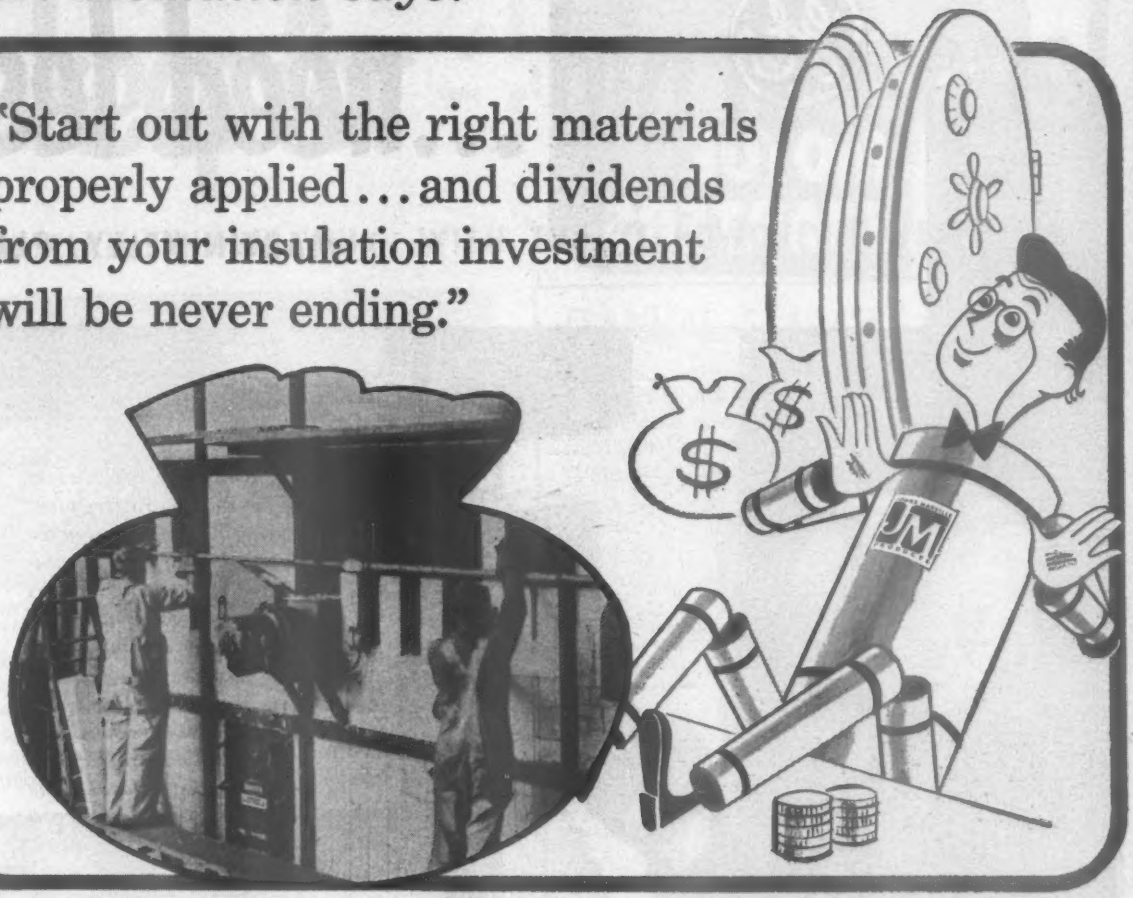
How will the Commies behave in the months ahead? Unless the FBI tags each and every one and relocates them (like the Japanese in the last war), they'll be a source of labor trouble. What the Commies did last war, though, may be a clue to future behavior. See "Labor Policy of the Communist Party During World War II" by Joel Seidman, University of Chicago professor. It's an article in Vol. 4, October, 1950, issue of Cornell University's *Industrial and Labor Relations Review*, $1.25 (Address: Ithaca, N.Y.).

Child labor law explained. Called *Employment and Age Certificates.* Available free from BLS, Department of Labor, Washington, 25.

World War II dispute settlement book. This book is a good summary of the government's effort to control wages and settle work stoppages in 1940-47. Prepared by people who should know—former War Labor Board officials—it will furnish guidance under present controls. Write to Superintendent of Documents, U. S. Government, Printing Office, Washington, D.C., for Bulletin No. 1009. Price: 75¢.

Mr. Insulation says:

"Start out with the right materials properly applied... and dividends from your insulation investment will be never ending."



Here are two important reasons why it will pay you to let Johns-Manville serve as your insulation headquarters:

YOU GET THE RIGHT MATERIALS — Regardless of the service conditions on your job, Johns-Manville has an insulation that fits the need. That's because Johns-Manville manufactures a wide variety of insulations of asbestos and other selected raw materials—for service from 400F below zero to 3000F above. Johns-Manville offers this complete line because industry requires many types of insulations and because no one material can properly serve as a jack-of-all trades for use on all jobs.

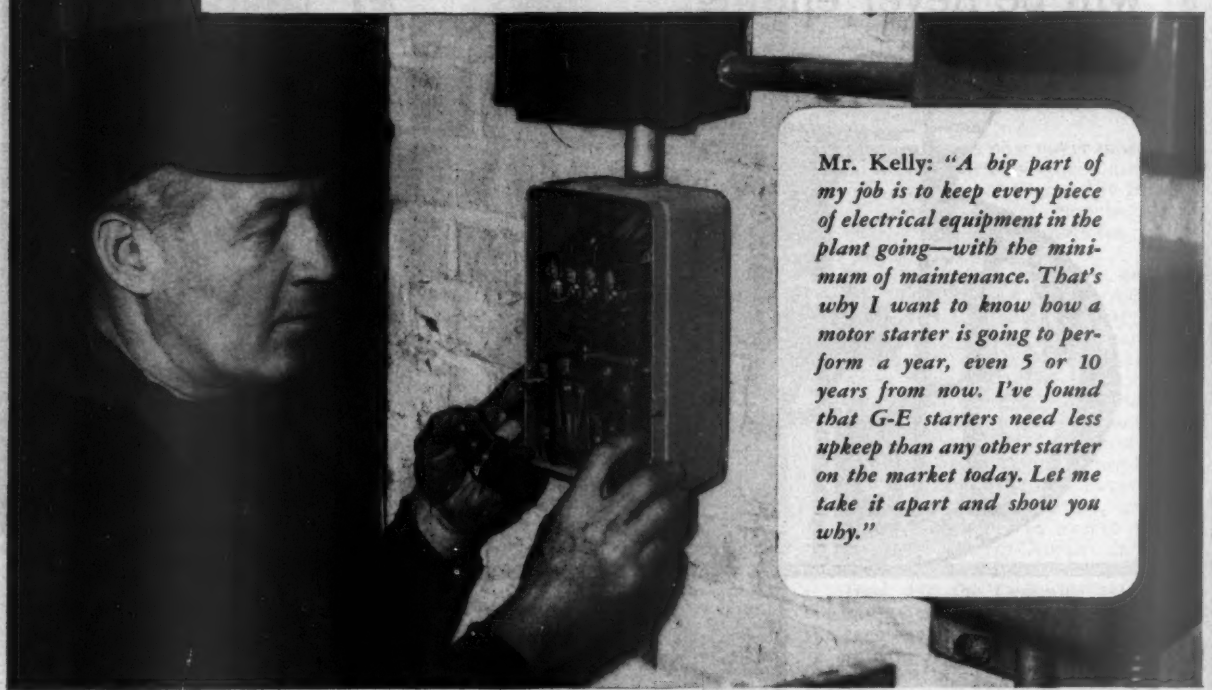
YOU GET THE RIGHT APPLICATION— Insulations serve at top efficiency only when properly applied. J-M Insulation Contract Firms have men with generations of insulation experience and training in Johns-Manville application methods. The way they engineer your job is your assurance that your insulation investment will pay a high return through the years.

Why not call on insulation headquarters for engineering advice about your insulation work. J-M Insulation Engineers are available to help select the *right* insulation for your particular service conditions. Write Johns-Manville, Box 290, New York 16, N.Y.

Johns-Manville *first in* **INSULATIONS**

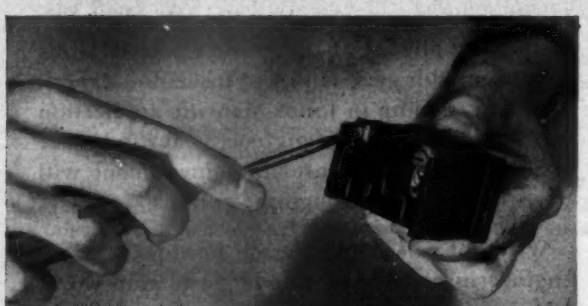
MOTOR STARTERS ...need less

MARTIN KELLY, PLANT-



Mr. Kelly: *"A big part of my job is to keep every piece of electrical equipment in the plant going—with the minimum of maintenance. That's why I want to know how a motor starter is going to perform a year, even 5 or 10 years from now. I've found that G-E starters need less upkeep than any other starter on the market today. Let me take it apart and show you why."*

Martin Kelly, Plant Electrician for John R. Evans & Co., changes an overload relay on G-E combination starter quickly and easily.



Mr. Kelly: *"First, the coil. It sure takes rough handling!"*

1 Right you are, Mr. Kelly. We call it the "Strongbox Magnet Coil." That block of plastic keeps the windings permanently protected against dirt, moisture, and oil. And if your screwdriver slips, it can't damage the windings.

Mr. Kelly: *"I've seen no sign at all that these contacts are burning or pitting."*

2 That's because they have fine silver tips that outlast by far the ordinary type contact. Even where it's a "start-stop" job with dozens of operations each minute, they'll stand the gaff.

GENERAL ELECTRIC

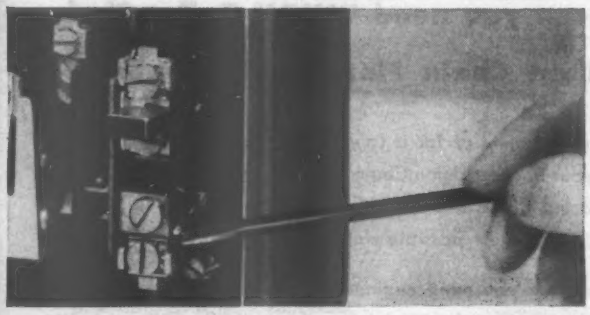
730-20

upkeep for 4 big reasons!

ELECTRICIAN, SHOWS WHY—WITH THE "SCREWDRIVER TEST"

Mr. Kelly: *"There doesn't seem to be any wear on the moving parts."*

3 That's right. The moving structure is rugged and basically simple. There's no metal-to-metal friction between magnet and coil; thus, little or no wear. And the "molded-in" lubricant in the coil keeps the magnet operating smoothly and quietly for life.



Mr. Kelly: *"Overload protection means a lot; I certainly don't want any burned-out motors these days."*

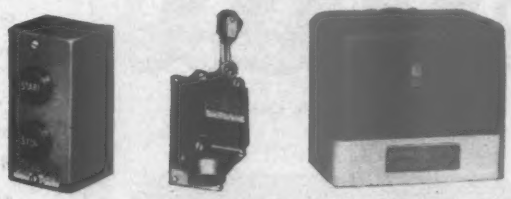
4 Those overload relays will give your motors all the protection they'll ever need. They are reliable and never need any attention. Heaters are in front and can easily be changed without disturbing any wiring.

MANUAL STARTERS, TOO . . .

For infrequent starting of 7½ hp or smaller motors, you can't beat a G-E manual starter for economy and dependable operation. . . Built to the same rugged specifications as the magnetic starter, it includes many of the same features for long life and easy upkeep.

Front-connected clamp-type terminals, and plenty of wiring space.
Fine silver contacts long outlast ordinary contacts
Sturdy, vibration-resistant, snap-action switch mechanism
Bimetallic overload protection with heaters readily accessible

A complete line of control accessories . . .



Push-button stations, limit switches, photo electric relays

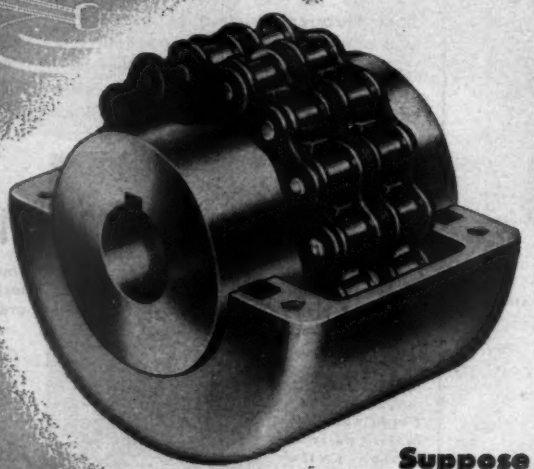
. . . and many others can make operations more automatic, more convenient.

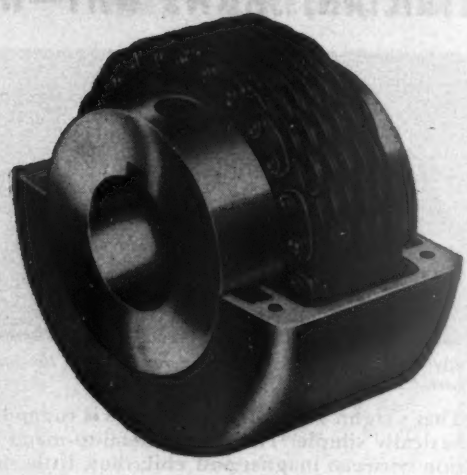
BUY ONE AND COMPARE!

Disassemble a G-E motor starter, magnetic or manual, and inspect it. See for yourself why G-E starters last longer, cost less to install, and are easier to maintain than any starters you can buy. Your G-E representative or authorized distributor can supply many models of G-E starters in NEMA sizes 0, 1, 2, and 3 for motors up to 50 hp; anticipate your requirements and place your order early. For more information on magnetic starters, write for Bulletin GEA-5153; manual starters, Bulletin GEA-1522. *Section 730-20, Apparatus Department, General Electric Company, Schenectady 5, N. Y.*

Wherever You are...

UNION CHAIN IS NEAR BY





Suppose you need UNION Roller Chain or Silent Chain Flexible Couplings . . .

. . . for replacement or for a familiar application. Just phone or write to your nearest Union Chain Stock Carrying Distributor listed on the facing page, and he will make it his business to see that you get the earliest possible delivery.

. . . ***or suppose you need*** engineering advice on the proper use of flexible couplings for the joining of two shafts of the same or different diameters in such a way as to allow lateral movement of either shaft and compensate for a slight misalignment of the shafts. Then you should get in touch with the nearest Union Chain district representative as listed on the facing page.

You will receive competent, experienced counsel, since Union Chain manufactures all types of steel drive chains and is thoroughly accustomed to solving power transmission problems for its customers. We will welcome your inquiry.

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UNION SILENT CHAIN

UNION HEAVY DRIVE AND CONVEYING CHAINS

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St. Louis, Missouri
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Trenton 4, New Jersey
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Union Industrial Corporation
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@ $1 per M cubic feet

If a hot water faucet, then actual FUEL WASTED heating 76,000 gallons costs approximately:

$27.65 if coal (7,900 lbs.)
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STOP this needless WASTE during today's MATERIAL and MANPOWER shortages with 'SEXAUER' "Easy-Tites" that outwear ordinary faucet washers 6-to-1, thus SAVING labor on 5 REPEAT repairs, PLUS water and fuel, while prolonging the life of SCARCE fixtures.

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"EASY-TITE"
FAUCET WASHERS

...a modern laboratory triumph, are compounded from du PONT NEOPRENE instead of rubber—to withstand DESTRUCTIVE HEAT common in present-day super-heating water systems—that formerly broke down washer's structure (tested to withstand 300°F.).

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Edition F, just out pictures over 2500 TRIPLE-WEAR plumbing REPAIR parts and Pat'd. Precision Tools. It's today's accepted buying guide for discriminating purchasing and maintenance personnel among thousands of top PLANTS, INSTITUTIONS and GOVT. AGENCIES that rely on SEXAUER repair materials. *Send for your copy today!*

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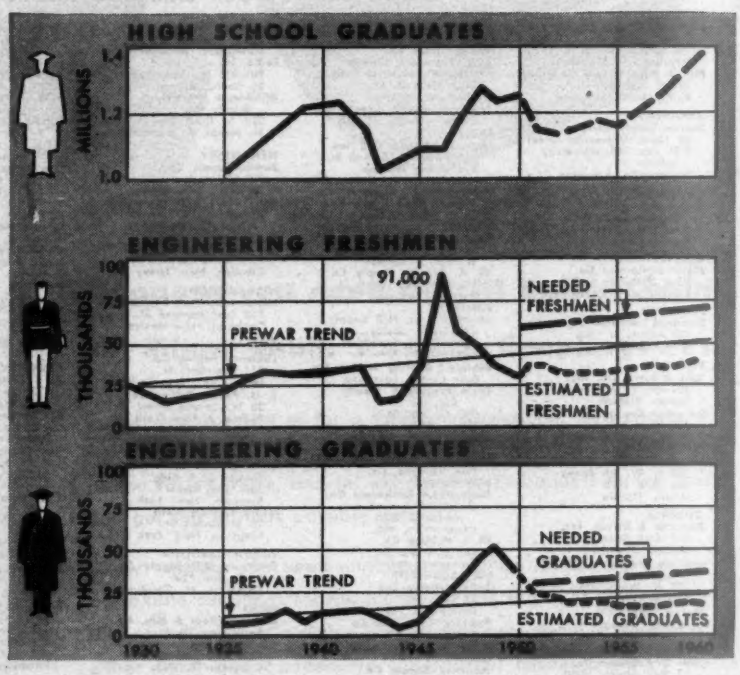
as advertised in THE SATURDAY EVENING POST

Industry isn't getting enough college-trained engineers today. The Army needs them, too, in large numbers.

College enrollment of engineering students is dropping off, due to a mistaken belief that there aren't many good jobs for young engineers in industry.

This is not a self-interested plea for draft deferment of engineering college students. It's a strong case for industry and the military to take a close look at their technical personnel needs and fill them effectively. It's a sharp warning that . . .

Engineers Are Getting Scarcer and Scarcer



By S. C. HOLLISTER
Dean, College of Engineering
Cornell University, Ithaca, N. Y.

OUR COUNTRY'S CHANCES of survival are dependent upon our ability to out-design, out-develop, out-produce, and out-perform our enemies.

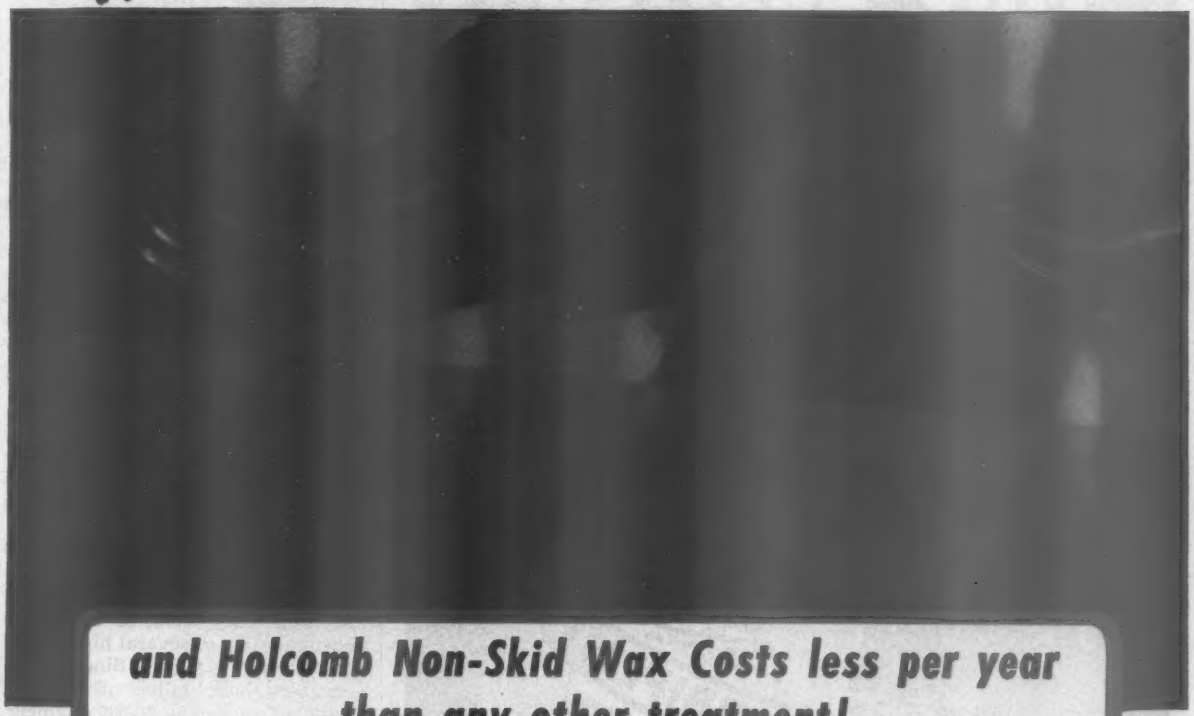
World War II brought to public attention the extent of the contribution to the war effort that was made by the scientists and engineers. We could not have fought, much less won, that war without the vast equipment planned, developed, built, and operated by engineers. The engineers are clearly indispensable.

But we are now short of engineers. As mobilization goes ahead, the shortage will be greater. The shortage will deepen if engineers are drafted or called up as reservists and used in jobs that don't require engineering training and experience.

The reason for the shortage is that there has been a falling off in enrollments in engineering colleges—because of a mistaken belief that engineers are in over-supply.

The chart on page 208 presents the essential factors in the outlook for supply of engineering graduates. The lower curve shows the annual output of the engineering colleges of the country for the

Looks slick~but it's skidproof!



and Holcomb Non-Skid Wax Costs less per year than any other treatment!

● You're *safe* with Holcomb Non-Skid Wax —Underwriters' Laboratories tests proved it has greater coefficient of friction. And you're sure to save money—for Non-Skid cuts waxing time, cuts number of waxings, keeps floors beautiful longer.

Non-Skid is one more development from the Holcomb research laboratories which concentrate on cutting cleaning costs. Holcomb builds materials that reduce the time cost—which is 95% of your cleaning dollar. Holcomb supplies waxes for every type floor surface; soaps and cleaners for use throughout your plant; brushes and cleaning equipment expressly designed for industrial and institutional needs.

Your nearby Holcomb Serviceman will come into your plant, make a complete cleaning survey, give you the best recommendations for walls, floors, ceilings, and machinery.

It will pay you to standardize with Holcomb—your one source, your dependable source, for scientific cleaning materials. Research laboratory and factory, Indianapolis 7; branches in New York and Los Angeles.

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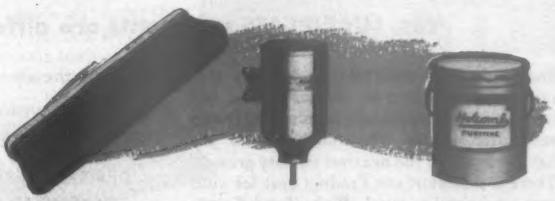
Scientific cleaning materials

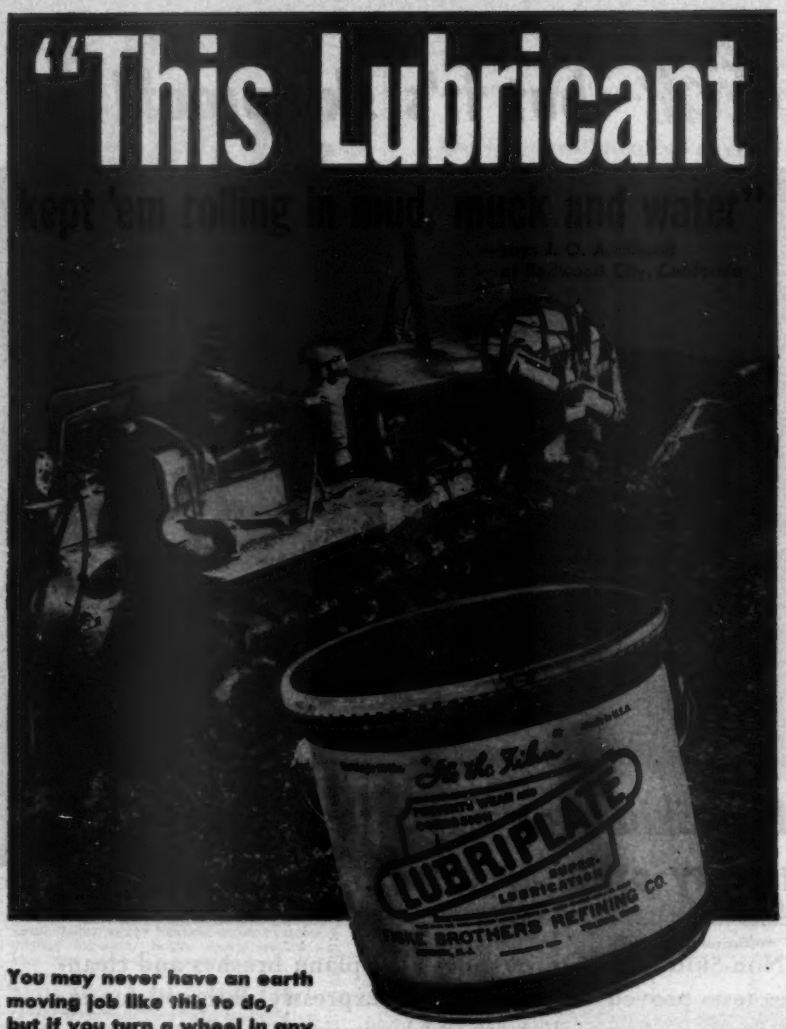


Factory Floor Brush. Three brushes in one—Bassine center, removes heavy, sticky dirt; Tampico middle row for medium dirt; outside row of stiff black horsehair for fine dirt and dust.

R.O.G. Powdered Hand Soap. Cleans in a flash. No chapping or burning of hands. Has two cleaning actions—chemical and fine abrasive. Convenient, economical, modern dispenser.

Puritine. The all-purpose, free-rinsing cleaning powder, the fastest ever developed. Water-softener, dirt-digger, free-rinser. 100% soluble—100% active—in hot or cold water.

"This Lubricant kept 'em rolling in mud, muck and water"



You may never have an earth moving job like this to do, but if you turn a wheel in any industry you can profit from Mr. Archibald's experience.

"The Leslie Salt Company called for bids for the conversion of 500 acres of salt marsh into crystallizing ponds for the production of bulk salt. The going was so tough that none of the several contractors invited to bid would take the job on a fixed price contract. Due to our success on similar work, the job was given to us on a cost plus basis.

"We moved in eighteen tractors as power units and the necessary Carryalls, Sheep Foots, Jeeps and other equipment. As soon as we removed the upper crust there was nothing but peat and marsh to run on. Tractors would sink in over the track rolls. To keep equipment rolling would require a special lubricant.

"Knowing from past experience that LUBRIPLATE No. 107 not only reduced friction to a minimum, but it also prevented rust even in salt water and would seal out the muck, we adopted it for track and general lubrication. We selected LUBRIPLATE APG-140 for all transmissions and final drives. The effectiveness of these two LUBRIPLATE Products is evidenced by the fact that during the entire job there were no replacements of track rollers nor were there any tie-ups of equipment due to replacement or breakage."

J. O. Archibald

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They reduce friction, wear and power consumption, prevent rust and corrosion and last longer than ordinary lubricants. LUBRIPLATE Lubricants are available from the lightest fluids to the heaviest density greases. There is a LUBRIPLATE Product best for your every lubrication need. Write for information about the use of them in your industry.

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LUBRIPLATE *THE MODERN LUBRICANT*

Engineers Are Getting Scarcer and Scarcer

Begins on page 208

academic years 1935-36 to 1950-51. It shows that from 1942 through 1945 the country, through its mistaken manpower policy, all but stopped the operation of engineering education. That is why industry today has a hard time finding critically needed engineers with five to ten years' experience. They were not produced at the rate they should have been during those years.

Beyond 1950, a dotted line shows the estimated number of graduates to be expected if schools operate without military withdrawals. It is the most optimistic production possible.

Following the war, the G.I. Bill of Rights brought 91,000 engineering students into college in the fall of 1946. They were, of course, an accumulation of several high school graduating classes. Since then, numbers have fallen off rapidly. Last fall only about 30,000 engineering students enrolled.

A dotted line indicates estimated freshman enrollment after 1950. The estimate was made before the Korean War broke out. Actual enrollment for 1950 did not reach the estimate, largely because of the rumor that the engineering field was well supplied.

Today the situation is tight in many fields of engineering, critical in others. Industry absorbed the last two 50,000-graduate classes, and is fighting for the 30,000 that will be graduated this June. Many of these graduates are in ROTC programs and may go directly into military service. Some will be called by the draft immediately after graduation. Still others are veterans.

In normal peacetime years it is generally accepted that industry requires at least 20,000 engineering graduates. Industry doesn't get all it needs. And today the Army is taking a lot. This makes it look as if the minimum annual need is not less than 30,000 engineering graduates—and more if they should be available.

How can we get not less than 30,000 engineering graduates a year? First, we need an annual in-

What's U. S. Rubber doing with Plastic Pipe?

Giving it extremely high impact strength, for one thing. A single .44 cal. revolver bullet, fired at a distance of 20 yards, merely dented this piece of pipe, which is made of U.S. Rubber's new plastic, Uscolite. This amazingly strong, lightweight, versatile piping is easy to handle, won't break if dropped. Furnished in standard lengths, it can be cut to length and threaded on the job. Uscolite is resistant to most chemicals. For more information, write to address below. In Canada, write to the Dominion Rubber Company.

U.S. ROYAL MEAT CUTTING TABLE TOP made of Uscolite stands up longer than wood. U.S. Royal tops retain their shape, are easier to clean.

THIS CONKEY FILTER, part of the sanitation system of a midwestern city, is equipped with Uscolite piping. Uscolite handles corrosive acids, alkalies, salts.

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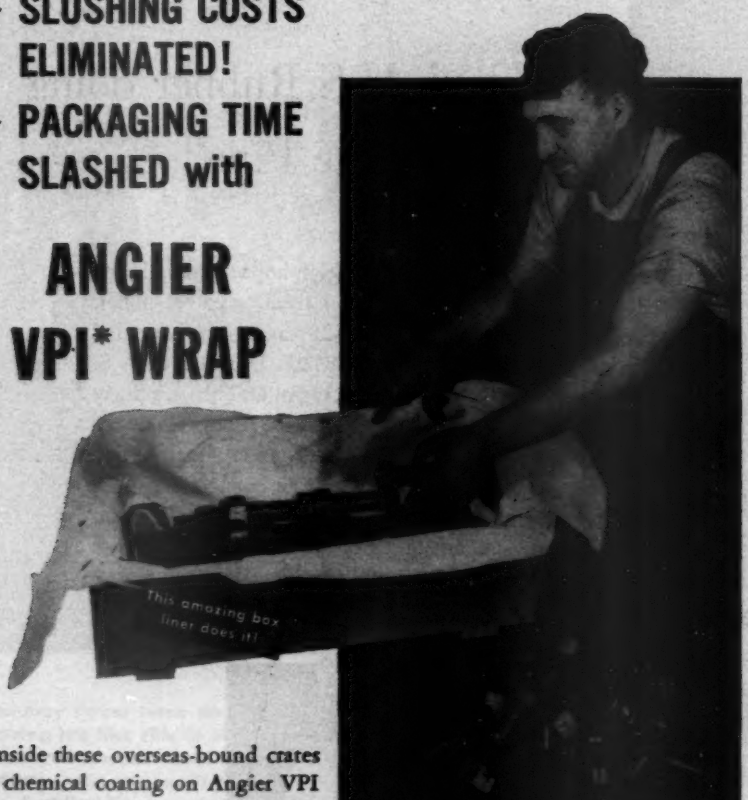

Inside these overseas-bound crates the chemical coating on Angier VPI Wrap slowly releases an invisible vapor. It permeates the area around these rolling mill parts . . . prevents rust almost like magic! So effective is this proven vapor rust preventive that rejects due to rust are eliminated. Slushing in grease or oil is not necessary—this means "cleaning" costs for customers are eliminated! Substantial savings in packaging time for VPI-users is an obvious fact!

For facts that tell how *you* can ship and store metal articles or parts RUST-FREE at less cost . . . write today to:

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Engineers Are Getting Scarcer and Scarcer

Begins on page 208

put of 60,000 freshmen. This is double the entering class last fall. How may twice as many freshmen be attracted to engineering schools? Are there that many high school graduates with an interest in engineering, who, at the same time, have the aptitude or ability?

Between 1950 and 1958 there will be a dip in the number of high school graduates. So we cannot rely on an increase in output of likely students from the high school to solve the problem.

Except for the war and the immediate postwar years, which were abnormal, the numbers entering engineering schools since 1935 range from 2.7% to 3.1% of the total high school graduating classes. On the basis of an average high school output of 1,200,000 boys and girls, 5% would be required to produce 60,000 engineering freshmen. This is about 10% of the boys graduating from high school. There is some doubt whether the combined factors of aptitude, ability, and interest would be found in so high a percentage.

It seems possible that the needed 60,000 freshmen may be at or above the number that can be expected to enter engineering. This brings home a clear fact: *There is not, and there cannot be developed, an inexhaustible supply of engineering talent. Instead, the supply is sharply limited.*

To do the best we can, we must use every way possible to acquaint high school principals, high school guidance counselors, and the high school students themselves with the shortage and need of all kinds of engineers. It is vital to our security and welfare that such information reach these persons. Businessmen can help spread the word.

What does all this mean to industry? It means that there will not be young replacements for engineering jobs vacated by the calling of reservists or of draftees. There will be only a partial supply of young engineers for such new jobs as conversion, retooling, and war production may require.

Inter-company pirating will only

Example: Synchronize parts of one machine, or machines operating in series

Where multiple operations are performed on one machine, or where a hook-up of different machines requires closely coordinated operation, accurate, *positive,* infinitely variable REEVES Speed Control solves every problem of synchronization.

REEVES Speed Control is adjustable "to a gnat's eye" with the turn of a handwheel or touch of a button. It assures a continuous flow of materials at the correct rate of flow from one section of a machine to another . . . or from one machine to another. It cuts down material waste; increases rate of production; insures uniform and improved quality of product; and reduces production cost.

REEVES is the *one* builder of a *complete* line of speed control units. By choosing from the wide range of sizes, designs, capacities, speed ratios and controls, you get a custom-tailored unit at production-line prices. For machines now in service or the new machines you plan to buy, specify REEVES Speed Control. Write, today, for complete information, including the new, 132-page catalog, No. F54-3N.

Synchronized and complete operating control of this Beaman & Smith Duplex Milling Machine is assured by the use of a REEVES Motodrive on each of the machine's two spindles, and by a REEVES Motodrive on the table feed drive. The units on the spindles provide a speed range of 20-120 rpm; and that on the table feed drive, a feed range of 1¾-8⅜ inches per minute. By accurately controlling spindle speed and table feed, REEVES Speed Control not only maintains maximum rate of production on all sizes milled, but also provides running speeds that assure maximum life for the cutters.

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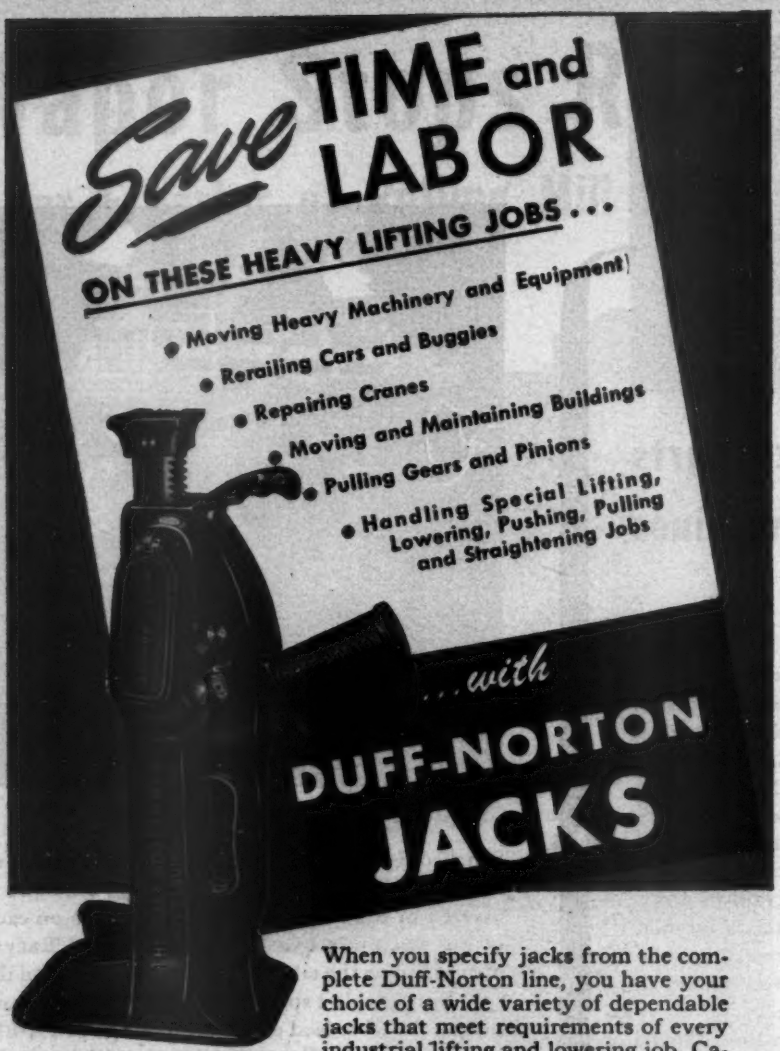
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DUFF-NORTON MANUFACTURING CO.

Engineers Are Getting Scarcer and Scarcer

Begins on page 208

add to the difficulties of staffing. Robbing the colleges of faculty members for industrial jobs will surely dry up the supply. It will also reduce the quality of training given by the colleges.

Industry will have to take a fresh look at the functions of the engineering personnel. Is each engineer being used in the most effective way possible? No engineer should be used in a job that others can fill as well. Supporting personnel, requiring less training and experience, should be used to spread as far as possible the effectiveness of each engineer.

Even competent supporting personnel will be tight. It is necessary to begin in-service training of such personnel, and to engage women as far as possible. The training programs of the last war need to be re-established. None of these steps can be put off. The organization of industries must be streamlined now.

Government agencies, including the armed services, should take cognizance of the situation. Two ways to do this are:

1. Coordinate the Engineering manpower needs of the services and of industry so that both will get the right share of the limited supply. Industry has to have engineers to supply the goods to the military. To assume that the direct military needs for engineers are paramount or exclusive would be a form of national suicide.

2. Use men with engineering training and experience only in jobs where such training and experience are mandatory. This aim can probably not be wholly achieved, but should be approached as nearly as possible.

We hear that the Russians in their latest five-year plan were scheduled to have produced 150,000 engineering graduates by the end of 1950. This matches our own output for the same period. During the next five years, however, we will drop by one third unless drastic action is taken to increase the supply of engineering freshmen and continue the training operation in full force.

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UNIT SUBSTATION TRANSFORMERS

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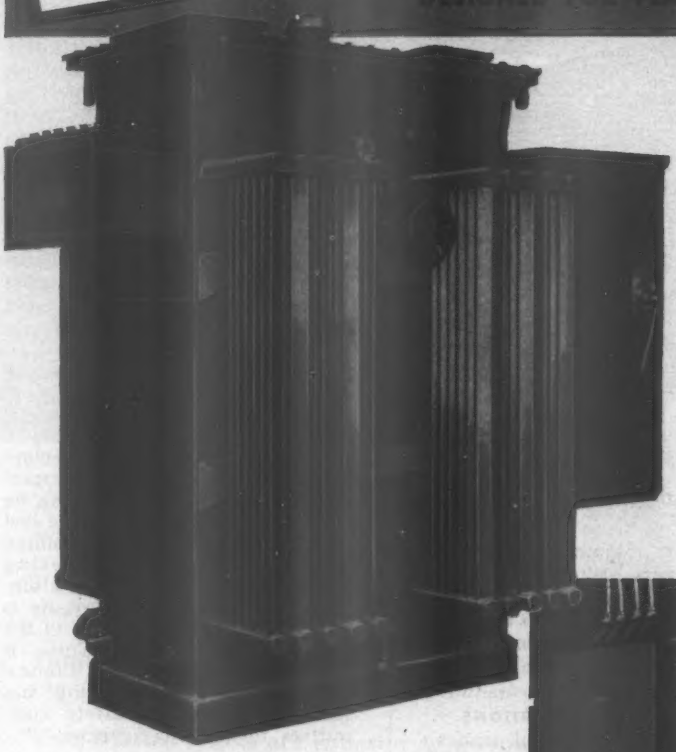

The ever-increasing demand for electric energy to power today's stepped-up production presents a critical problem. The answer to this problem has been found in load-center power distribution systems. The vital part of the load-center system is the transformer. If a switch or circuit breaker fails, only a part of the system is affected—but if the transformer fails, the entire system is dead.

Wagner Unit Substation Transformers assure a continuous, dependable flow of power. They are carefully designed to meet your distribution requirements, and are available with various types of entrances and controls for the high-voltage circuits, and with proper throats on the secondary side to connect to any make of switchgear, in the usual range of ratings up to 2000 kva.

Wagner-equipped unit substation in a synthetic textile plant.

Dry-Type Indoor Transformers

Wagner now furnishes three-phase dry-type transformers in ratings up to 2000 kva in the 15 kv class and below. These units are compactly housed in neat, attractive enclosures, which can be arranged to include primary and secondary switchgear compartments to form readily accessible, closely-coupled unit substations. Relatively light in weight, so that they can be used in multi-story buildings, they are readily adaptable to any installation requirement.

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BATTERY ELECTRIC TRUCKS helped us *increase production* 55%

(Based on an actual case history)

We make paints and varnishes down at our plant. Business was so good we couldn't keep up with the demand! So, after looking around for a solution, we installed a battery-electric truck-and-pallet system of material handling. Here's what happened:

1. FASTER OPERATIONS—Loading and unloading of rail and highway shipments became easier and speedier. Man hour requirements were lowered substantially.

2. STORAGE SPACE FULLY UTILIZED—By tiering unit loads, we made full use of vertical storage space and consolidated all warehouse operations under one roof.

3. INVENTORY TIME REDUCED 91%—Formerly it took four men three days to take inventory. Now two men can do it in one day.

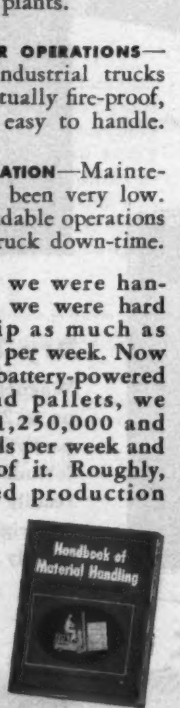
4. EASIER WORK FOR EMPLOYES—Battery-electric trucks took away the drudgery of material handling. Employes were happier, and many men were released to production lines, thus enabling us to take on additional work from some of our other overloaded plants.

5. SAFER, CLEANER OPERATIONS—Battery-electric industrial trucks are fume-free, virtually fire-proof, clean, quiet and easy to handle.

6. LOW-COST OPERATION—Maintenance costs have been very low. This means dependable operations . . . negligible truck down-time.

RESULT—When we were handling manually, we were hard pressed to ship as much as 800,000 pounds per week. Now with the help of battery-powered fork trucks and pallets, we ship between 1,250,000 and 1,500,000 pounds per week and think nothing of it. Roughly, we've increased production about 55%!

Records like these can be yours, too, with a proper system of material handling. You can find out *how* from our "Handbook of Material Handling with Industrial Trucks." Any company official may obtain a free copy by writing us on company stationery.



THE *Electric* INDUSTRIAL TRUCK ASSOCIATION
3701-B NORTH BROAD STREET · PHILADELPHIA 40, PENNA

BEHIND THE BYLINE

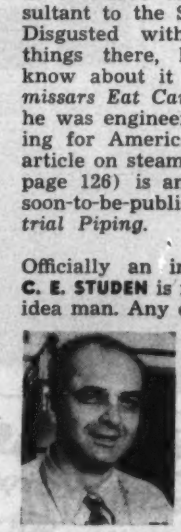
Begins on page 2

R. W. KISLIK has two industrial talents that usually don't mix. He's Maidenform's Assistant Comptroller. But, because of his interest in industrial relations and his skill in case writing and the conference method of teaching (thanks to a year on the staff of the Harvard Business School), he was chosen to work with consultant Lateiner (below) in developing refresher training courses. For the results they got, see page 94.

Co-author of the Maytag refresher training article (page 94) is **A. R. LATEINER.** A management consultant specializing in personnel development and supervisory training, he has spent the last 10 years planning and conducting conference training courses. He is on the staff of the City College of New York, is director of the Accident Control Program of the city, and has served on industrial safety committees for various agencies.

C. T. LITTLETON has been around in the course of his industrial career, and even went (voluntarily) to Siberia. He worked there in 1929-1930 as a technical consultant to the Soviet government. Disgusted with the scheme of things there, he let the world know about it in his book *Commissars Eat Caviar.* Most recently he was engineer in charge of piping for American Cyanamid. The article on steam traps (starting on page 126) is an excerpt from his soon-to-be-published book, *Industrial Piping.*

Officially an industrial engineer, **C. E. STUDEN** is really Hauserman's idea man. Any off-the-beaten-track problems go to him. The central file room (see page 77) was one of these. Now at work designing new packaging methods, he joined the company in 1944 as a production supervisor, and was in charge of converting a plant from war to peacetime production.



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Save drive-space, plant space! Cogs permit much shorter center-to-center distances—up to 25% shorter. They save up to 47.2% in drive area.

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14 years ago a set of Dayton Cog-Belts went to work, running the tipple at a coal mine at Logan, W. Va. These same veteran Cogs are still on the job! The mine superintendent predicts that they are good for years to come. If you have a drive that's a real toughie, turn it over to a team of Dayton Cog-Belts, for a long, trouble-free life!

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YOU MUSTN'T MISS—

INDUSTRIAL NEWS, BEGINNING ON THIS PAGE

TIMELY HINTS TO BETTER MANAGEMENT ON PAGE 234

QUOTES FROM INDUSTRY'S LEADERS ON PAGE 236

IDEAS TO STIMULATE YOUR THINKING, ON EVERY PAGE

INDUSTRIAL NEWS

Guard snaps visitor's picture, before the visitor signs in.

A minute later, pictures are ready. One for identity badge, three for files.

New Camera Tightens Plant Security

Visitors to war plants may soon find their identity pictures being taken, printed, and put in identity badges before they have completed signing the registration book. The new Fairchild-Polaroid Personnel Identification camera makes this possible. A modification of the already well-known Polaroid-Land camera, the new camera takes four pictures on a single print. They're developed in the camera itself, and are ready, on the spot, in fifty seconds.

Prints are produced in twin sets. Four pictures of the same person (in two views) or two pictures each of two different persons are produced on one print. In the photos above, one-half of the negative was used to get a twin set of full face pictures. The visitor was then asked to turn to a profile view, and the other half of the negative exposed. One picture was immediately placed in his identity badge, and the other three placed in the company files.

The camera is a cinch to use. Built-in attachments insure proper positioning of the subject and proper lighting, and eliminate over- or under-exposure. The cost is in line with conventional photographing methods. The new camera is portable. This means that pictures for identity badges and personnel files can be taken with a minimum disruption of production, and that the badges can be issued on the spot, in less than a minute.

The camera is a product of Fairchild Camera and Instrument Corp., 88-06 Van Wyck Blvd., Jamaica 1, N. Y.

More on next page

Udylite Full Automatic Plating Machine at Coggins Manufacturing Company, Meriden, Conn.

How's *that* for a record of rugged dependability? In operation anywhere from eight to ten hours a day . . . day in and day out, this Udylite Full Automatic Plating Machine thrives on hard work. And this record is no accident. Udylite Plating Machines are designed for stamina and long-lived operation.

Udylite machines are built from the ground up as self-integrated units to withstand stress and strain. Base, superstructure, tanks and controls are built for each other and factory-assembled to eliminate mis-matching and installation headaches. Udylite machines are supported *on their own* bases. There's no need for special foundations or shoring. And Udylite's simplified design with hydraulic lift and pusher assemblies make operation and maintenance a simple task.

Let your nearby Udylite Technical Man give you *all* the facts about Udylite Plating Machines today. There's no obligation. Just give him a 'phone call or write direct to *The Udylite Corporation, Detroit 11, Michigan.*

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Imagine a railroad crew that purposely sets up a crash between two loaded freight cars! That's what's happening in the scene above, and it goes on all the time—for this is Signode's famed outdoor test track.

The big idea behind this activity is to find out . . . under operating conditions . . . exactly what happens to your shipments in transit; what causes product damage; and what to do about it.

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as evidenced by this type of full-scale laboratory equipment. To more than 30,000 shippers, Signode's leadership in the development of better ways to make steel strapping . . . and to use it . . . has meant millions of dollars saved.

If you are engaged in defense or essential civilian production, it will be to your advantage to get the whole story. For now, if ever, the best use of men and materials, the quickest, surest way of distributing goods, is the first order of the day.

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In Canada: Canadian Steel Strapping Co., Ltd.,
Foreign subsidiaries and distributors world wide

YOU MUSTN'T MISS—

Begins on page 222

Plant Protection in an Emergency

A detailed plan for the protection of industrial plants has been offered by Col. Frederick C. Bothwell, assistant deputy director, New York State Civil Defense Commission. It goes like this:

First, each plant trains groups of workers to undertake special duties—shutting off machinery, etc.—in an emergency. A single person controls all groups.

Second, you set up a suitably protected control center, a reporting system to keep the security superintendent informed at all times during the emergency, and adequate communications for rapid transmitting of orders.

Finally, you establish an air raid warning system. Along with it, you form a warden group. Duties of the group are to lead employees to shelter areas, understand local warning and communication systems, watch for fires, administer first aid, and assist in preventing panic.

Women Returning to Industry

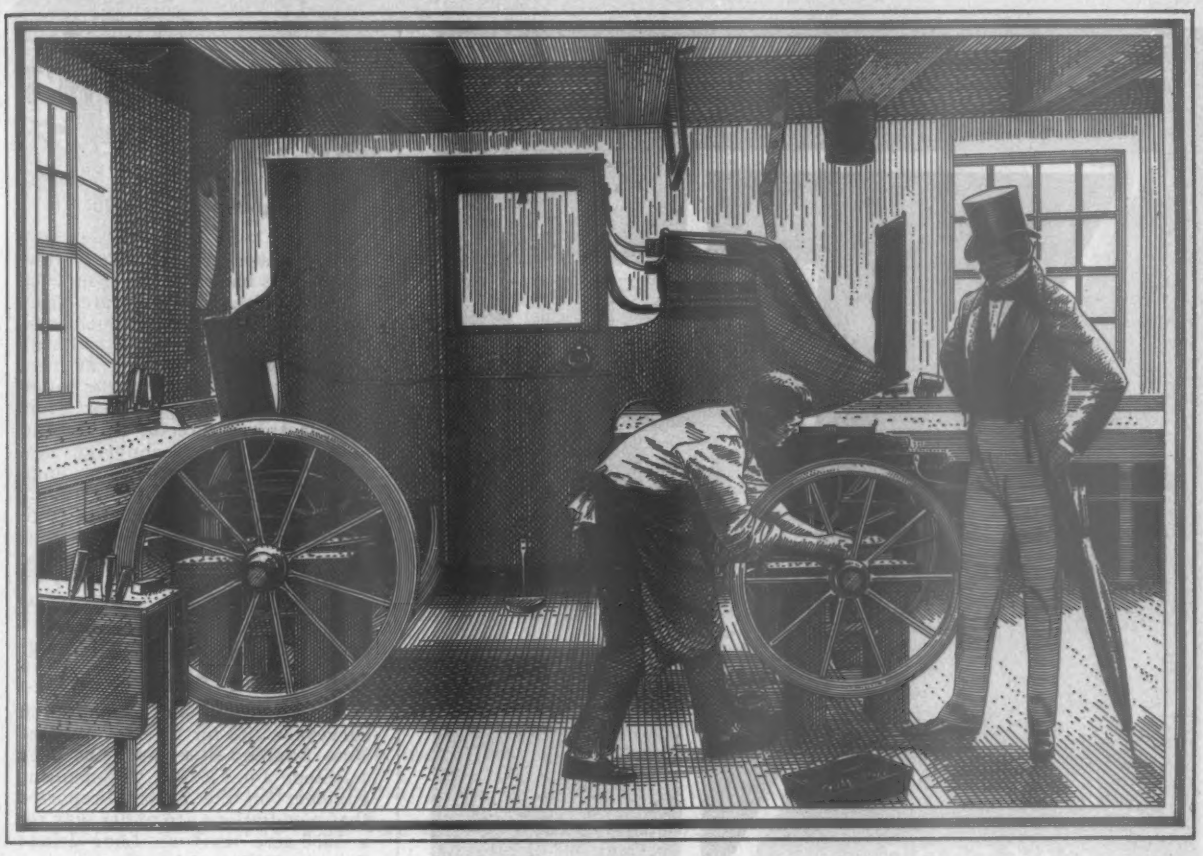
Rosie the Riveter has put her hair back in a hair net and returned to the production line. Many plants are hiring increased numbers of women to work in the shop, in the offices, and in some cases in the engineering departments.

Among the leaders in calling again on women are the aircraft companies. At Pratt & Whitney's East Hartford plant there were 967 women employees in June, 1950. Now there are over 2000 on production jobs, and the number is increasing daily. But they're still a long way from the peak World War II figure of 12,000.

Republic Aviation, Farmingdale, Long Island, is hiring women workers to help turn out the Thunderjet. Actually, women never did step entirely out of the picture. Just before Korea, about 6% of Republic's total work force of 6000 were women who had stayed on from the last war. Today the work force is up to about 8000. About 8% are women. Most of them worked during the last war, and do about the same jobs now.

Since Republic sent out the call

More on next page



Craftsmanship.... *1951 Style*

In 1838, Lord Brougham called on one of England's greatest coachmakers to construct a new style of coach invented by his lordship . . . each part to be handmade with craftsmanlike care, even to the carriage bolts.

Especial attention was paid to these bolts that held the other parts together. For it was realized that the performance of the assembled product depended largely on the performance of its fasteners.

Quality fasteners are equally important today to quality products such as modern motor cars. But, 1951 craftsmanship is more easily achieved . . . through the aid of *specialists*, like the RB&W worker in the small illustration. He specializes in fasteners alone, devoting a craftsman's skill to producing bolts, nuts, screws and rivets of uniform accuracy, dependability and physical properties.

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YOU MUSTN'T MISS—

Begins on page 222

for more workers, their daily telephone calls have swelled from 2000 to 3500. Most of these are from women wanting their old jobs back. Republic reports that they're hiring women on the same basis as men.

Women are entering the more technical jobs, too. A report from the placement director at the Illinois Institute of Technology says that the heavy demand for engineering college graduates is forcing employers to seek women engineers. And of course the shortage of engineers will get a lot worse before it gets better. (See story on page 208.)

New England Steel Mill Going Ahead

After several years of study and surveys, a site for the long-awaited New England steel mill has been selected. John E. Kelly, consulting engineer on the project, reported that negotiations are under way for a 1600-acre tract on Long Island Sound at Waterford, Conn.

The government has issued a certificate of necessity for the $250-million plant, which is to be financed by the New England Steel Development Corporation. The proposed new facilities would produce a million net tons of ingots annually and 710,000 net tons of strip mill products.

Output Records Fall

The year 1950 was one of many "new highs." Here are just two in America's biggest industries, that are an indication of how much our production is going up.

Production of steel set a new high level at 96,713,276 net tons. That tops 1944, the previous record year, by over 7-million tons; and it's 9% more than the peacetime record, set in 1948.

Chevrolet, which just finished counting, came up with two records. Their U. S. plants turned out 2,015,150 vehicles, and their total production (including Canadian plants) was 2,107,493. Those figures exceed industry records for a year's production by a single company that have stood since 1923.

On December 29th, they had a biggest day (9889); and in June they had the biggest week (50,784) and the biggest month (211,133).

More on next page

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(28) PowerMaster Stackers, Work-Height Lifters, Handy Hoisters, Portable Cranes

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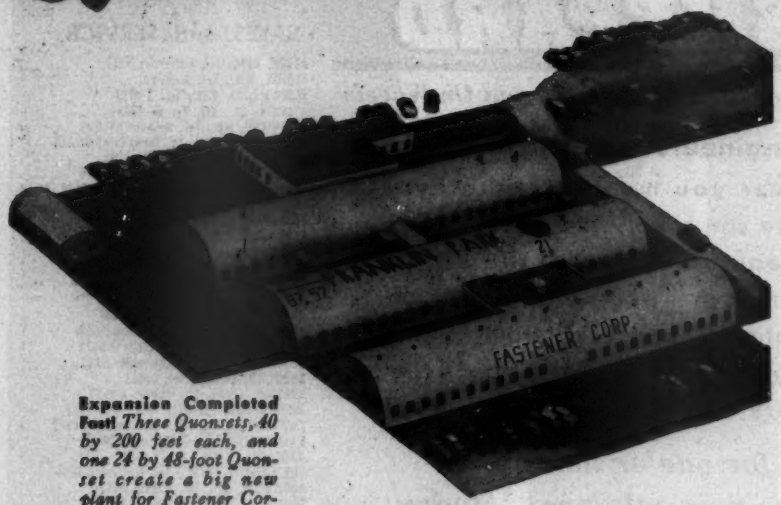
Build Quicker with QUONSETS



Expansion Completed Fast! *Three Quonsets, 40 by 200 feet each, and one 24 by 48-foot Quonset create a big new plant for Fastener Corporation at Franklin Park, Illinois.*

IDEAL FOR FACTORIES, WAREHOUSES, MACHINE SHOPS, STORAGE OR SERVICE BUILDINGS

For additions to your present plant—or for new plants—Quonsets mean *fast* completion, economy of materials, adaptability to *any* use. Also, should plants need more expansion later, you can add Quonset to Quonset, according to the need.

Made of N-A-X HIGH-TENSILE steel, Quonsets provide fire-protection and permanence far surpassing old-style buildings. They require little upkeep—are easily maintained. Let Quonsets serve you now. Write us today.

GREAT LAKES STEEL CORPORATION
Stran-Steel Division • Ecorse, Detroit 29, Michigan

PRODUCER OF N-A-X HIGH-TENSILE STEEL

Expands Floor Area by 20,000 Sq. Ft. *Bill Jack Scientific Instrument Co., San Diego, Calif., began with two Quonsets and added 20,000 sq. ft. of floor space in just 50 days.*

NATIONAL STEEL CORPORATION

STRAN-STEEL AND QUONSET REG. U. S. PAT. OFF.

YOU MUSTN'T MISS—

Begins on page 222

Labor-Management Scholarships Set Up

A scholarship fund has been established by 11 electrical contractors in the New York area. Each concern will subsidize a scholarship for the son of a member of the International Brotherhood of Electrical Workers (AFL).

With the 11 new scholarships, and two already established, 13 students will enter Columbia University next September. The scholarships cover tuition, books, and fees for three years of liberal arts study, plus three more years in the electrical engineering department.

The program in its entirety will reach an annual cost of more than $55,000—comparable to an endowment of $1,384,500. About 1000 students who are sons of the electrical union's members will graduate from high school this year. Scholarship winners will be selected by the university.

Spending for Plant Improvement Hiked

Industry is expected to spend about $10-billion in the first half of 1951 for plant expansion and improvement. This figure is based on a survey made by the Securities and Exchange Commission and the Department of Commerce.

If they've hit it right, this will be the greatest outlay of its kind in the nation's history.

According to Office of Business Economics figures, of the $84-billion spent by industry in the five post-war years, 1946 to 1950, 44%, or $37-billion, was spent in expansion, improvement, or replacement of the country's manufacturing plant.

This is the kind of money it's taken, and it's going to take, to give industry the productive capacity it needs in the defense effort.

Pension Trusts Seek New Investments

Pension trusts, which have confined themselves largely to the most conservative of investments, have joined the search for investment opportunities that are more advantageous.

Following the lead of life insur-

More on next page

THAT P&H AC WELDER LOOKS GOOD TO ME, JIM. WE CAN GET IT OFF THE FLOOR —AND HAVE MORE ROOM TO WORK!
THAT'S RIGHT, BILL— AND WITH CONTROL AT THE WORK WE GET MORE DONE, AND DO IT BETTER!

Save floor space, cut welding time for more production at lower cost

. . . . use P&H AC Arc Welders with exclusive Dial-lectric remote control

Give yourself more room for your production needs. Mount your P&H Welder off the floor, out of the way.

Dial-lectric remote control lets you do this. Your operator can turn the heat on *at the work*. It also cuts down his "walking time" . . . turns it into *welding* time for increased output.

Besides saving space P&H Dial-lectric control eliminates cores, coils, sprockets, gears and other moving parts that cause excessive maintenance and downtime.

P&H AC Welders are available in a full range of sizes up to 625 amps. See your P&H representative or distributor for full details on how this outstanding welder can save you time and money.

ADDITIONAL FEATURES OF P&H AC ARC WELDERS

- Easy, quick-start arc
- Stable arc
- No arc blow
- Continuous, step-less amp control
- High electrical efficiency for lower power costs
- Connectable to 220 or 440 volts
- NEMA rated

P&H

WELDING DIVISION
4525 W. National Avenue
Milwaukee 14, Wis.

HARNISCHFEGER
CORPORATION

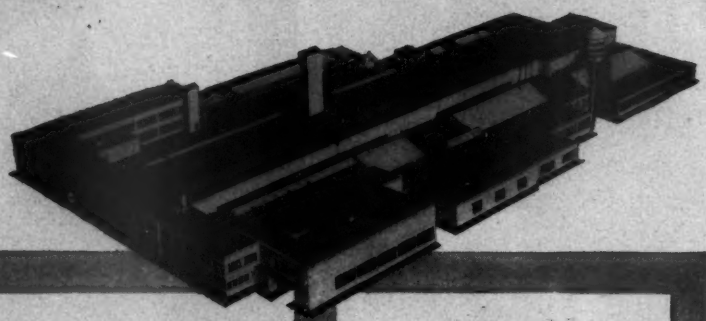
Excavators • Overhead Cranes • Hoists • Arc Welders and Electrodes • Soil Stabilizer • Crawler and Truck Cranes • Diesel Engines • Cane Loaders • Pre-assembled Houses

2257

Haughton Elevator Co.

keeps heating costs down...

operating efficiency up...



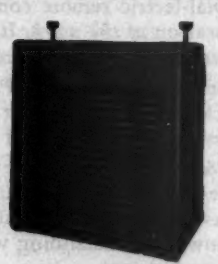
1938

76,000 sq. ft. plant area, 41 Janitrol unit heaters

1950

170,000 sq. ft. plant area, 59 Janitrol unit heaters

12 YEARS PERFORMANCE RECORD SHOWS JANITROL GAS HEATING COSTS LESS...



Twelve years ago, Haughton Elevator Company estimated they saved $15,000 by installing Janitrol Unit Heaters instead of a central heating plant, with a yearly fuel saving of 53%.

As plant expansion took place, it was easy to add Janitrol heating equipment at low initial cost and without interfering with plant efficiency.

Note: In the past year, total heating cost (6,066 degree days) was only $4570.

Complete details on the advantages of this Janitrol installation and hundreds of others are available to businesses interested in clean, fast, economical and automatic heat directed exactly where you want it.

Quick plant expansions for defense work need not create emergency heating problems. Janitrol Unit Heaters are quickly and economically installed for flexible operation.

Write for your copy of "Commercial & Industrial Heating", for a semi-technical description of efficient gas heating installations of all types.

Janitrol *Gas Fired* UNIT HEATERS

PRODUCT OF SURFACE COMBUSTION CORP., TOLEDO, OHIO

Also Manufacturers of Surface Industrial Furnaces, Kathabar Humidity Control

YOU MUSTN'T MISS—

Begins on page 222

ance companies, they've moved into real estate, and there have been a few ventures that by trust fund standards are spectacular.

For example, a pension trust of the General Tire and Rubber Company recently purchased the big Don Lee radio and TV chain on the West Coast. The trust plans to keep the cash and income-producing real estate, and sell or lease the rest of the holdings.

Public OK's "Bigness" and Company Profits

Three-quarters of the people have no fear of large companies and actually feel they should be encouraged or at least left alone by the government. This is the conclusion of Psychological Barometer surveys involving 7500 personal interviews made in cities and towns from coast to coast.

The question asked was: "Which of these four statements most nearly says what you yourself believe about big companies?"

The answers broke down this way:

They should be encouraged: 48%
They should be left alone: 25%
They should be watched: 11%
They should be broken up: 2%
Uncertain: 14%

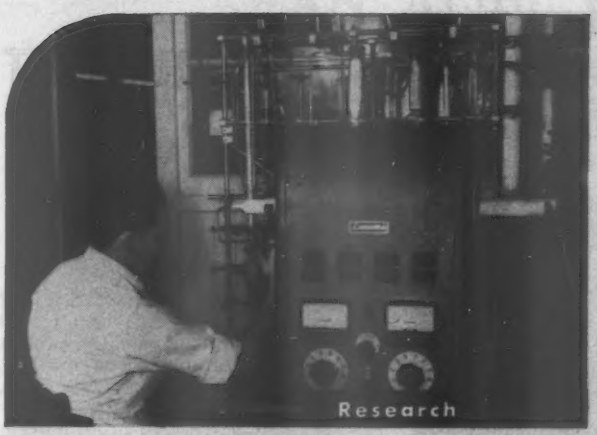
On this question there was no difference between the answers that were given by union and nonunion families.

A second Barometer survey shows that a large part of the public thinks that the government—not business or labor unions—is primarily responsible for inflation and high prices. 5000 people were asked the question: "Because of inflation, the dollar will buy less today than two or three years ago—which of these three is most to blame?"

High government spending and borrowing: 49%
Labor unions pushing up wages: 18%
High company profits: 14%
Uncertain: 19%

On this question, the answers were in the same proportion in all income and educational groups. There were some differences between union and nonunion families, but both groups laid greatest blame on government.

More on next page



WHICH

N.B.M. service is most important

FOR PRODUCING BETTER BRONZE BEARINGS AND CASTINGS?

The answer is that *ALL FOUR* are equally important... and ALL FOUR represent the reasons why more and more users of Non-Ferrous Bearings and Castings become N-B-M Customers.

The complete facilities of National Bearing Division for Research, Engineering, Production and Finishing are unique. They represent an important *chain of service*—an ability to translate your *problems* into *requirements*, and requirements into *actual products* that serve you better.

The most modern equipment for alloy testing, molding, casting and finishing assures you of finer, more dense, closer-to-size bearings and castings—products that have higher resistance to wear and greater long-range economy.

Yes, this complete N-B-M Service is worthwhile investigating. Call in your nearest N-B-M Representative—he will gladly show you how this service can be geared to serve you with maximum efficiency.

THIS NEW CATALOG completely describes N-B-M Facilities—how they can cut costs for you and tie in with your own production. Write for a free copy today.

AMERICAN Brake Shoe COMPANY

NATIONAL BEARING DIVISION

4928 Manchester Avenue • St. Louis 10, Mo.

PLANTS IN: ST. LOUIS, MO. • MEADVILLE, PA. • NILES, OHIO • PORTSMOUTH, VA. • ST. PAUL, MINN. • CHICAGO, ILL.

REMEMBER THIS AND SAVE:

Only Smooth Power IS ECONOMICAL POWER!

NO FINER FEATURES

Ultra-precise tolerances... races of chrome alloy electric furnace steel with uniformly fine-grained homogeneous structure... rugged, exactingly balanced, deep grooved ball paths "generated" for true race curvature and polished to super smoothness ... micro-lapped chrome steel balls matched in sets and sphericity to within .000025".

It pays, and pays well, to remember that only from machines that transmit their power smoothly do you get truly efficient, truly economical power. And smooth power can only come from the proper and adequate application of good bearings . . . for example, AHLBERG bearings.

Try, test and compare Ahlberg bearings. We believe you'll decide your dollars can't buy better performance than these fine bearings give. Whether your requirements are for production or maintenance you will find Ahlberg an understanding, complete and capable bearing source. We have served industry—every branch of it—since 1908. We are confident that from this accumulated wealth of experience can be drawn worthwhile savings for you—in reduced operating and maintenance costs of the machines you make or use. Write, wire or 'phone today!

AHLBERG BEARING COMPANY

Precision Craftsmen Since 1908

3025 West 47th Street, Chicago 32, Illinois

DISTRIBUTORS IN ALL PRINCIPAL INDUSTRIAL AREAS

AHLBERG

BALL BEARINGS • ROLLER BEARINGS • THRUST BEARINGS • BALL BEARING HOUSINGS

YOU MUSTN'T MISS—

Begins on page 222

6% Is Predominant Profit Margin

The National Association of Manufacturers recently completed a study indicating that the impact of manufacturers' profit margins upon prices cannot be very great. Their figures show that:

1. Historically, 10% profit margin on sales for any major manufacturing industry is most unusual. The record of 20 industry groups for 21 years shows only eight profit figures (out of a possible 420) above 10%.

2. During the nine years 1941-1949 inclusive, no major manufacturing industry had a final average profit margin as high as 10% on sales.

3. Profit margins under 6% on sales have been predominant in manufacturing for many years. The statistics for the 20 major industry groups show that in each year, 1942 through 1945, 19 out of 20 industries had less than a 6% average profit margin. After that, through 1949, at least 13 out of 20 each year had less than a 6% profit.

Smaller Companies Get Government Contracts

As of the beginning of this year, more than one third of all government contracts awarded since the start of the Korean War have been for $50,000 or less. The government's announced purpose is to enable smaller concerns to compete for government business. Here are the figures: during the period mentioned, about 6200 contracts were awarded, and 2366 were in the less-than-$50,000 class.

Of course, the 25 companies which got the greatest total in dollar value of contracts are mostly big concerns. General Motors leads, with the aircraft companies, Ford, General Electric, and Standard Oil close behind.

These figures are from a new Directory of U. S. Government Contracts and Contractors, published by U. S. Bid Information, a company supplying a daily bid information service to subscribers. The directory lists contract winning companies, describes each item of each contract, quantity, date of award, name of the procurement office awarding the contract, and the total dollar value.

More on next page

AN ALIBI WON'T BRING BACK MONEY WASTED MACHINING IMPERFECT CASTINGS!

So put your confidence in radiography . . . one of management's surest instruments for cutting cost!

An outstanding example of the contribution of radiography to production processes is revealed by an automobile manufacturer. By pointing the way to improved foundry techniques — radiography is credited with saving this company in excess of a quarter million dollars a year in one part alone.

Another story of savings and profit made possible through the magic of radiography. A double-edge tool that not only diagnoses accurately and authoritatively — but suggests treatment as well.

Radiography shows where savings can be made, designs improved, new techniques developed. Write for interesting, informative booklet, "Radiography as a Foundry Tool." General Electric X-Ray Corporation, Dept. AC-3, Milwaukee 14, Wisconsin.

GENERAL ELECTRIC
X-RAY CORPORATION

Here's BIG NEWS on Blast Cleaning Dust Control Precision Finishing

Blast Cleaning Unit is PORTABLE!

Ideal for maintenance and many other jobs, including removal of rust, dirt, scale, etc. Economically cleans large objects like tanks, bridges, structural work before painting. Six sizes, stationary or portable, from.....$170.00 and up

Hydro-Finish SPEEDS POLISHING!

Removes scale, and directional grinding lines . . . prepares surfaces for plating and holds tolerances to .0001"! Liquid blast reduces costly hand cleaning and finishing of molds, dies, tools, etc. Models from $1295.00 and up

STOP DUST at the SOURCE!

Pangborn industrial type Unit Dust Collectors trap dust at source. Machine wear is minimized, housekeeping and maintenance costs reduced. Solves many grinding and polishing nuisances and material losses. Models from $286.00 and up

COMPACT Blast Cabinet for SMALL WORK!

Ideal for producing smooth, clean surfaces on pieces up to 60" x 36" in size. Cleans metal parts, removes rust, scale, grime, dirt, paint, etc., in a few seconds. Saves money all year 'round. Models from $315.00 up

Look to Pangborn for the latest developments in Blast Cleaning and Dust Control Equipment

Pangborn MAIL COUPON FOR DETAILS

Check for more information
- ☐ Blast Cleaning Cabinets
- ☐ Blast Cleaning Machines
- ☐ Unit Dust Collectors
- ☐ Hydro-Finish Cabinets

PANGBORN CORP., 2100 Pangborn Blvd., Hagerstown, Md.
Gentlemen: Please send me more information on the equipment I've checked at the left.

Name.....

Company.....

Address.....

City.....Zone....State.....

YOU MUSTN'T MISS—

Begins on page 222

TIMELY HINTS

Shipment of White-Hot Ingots Now Possible

This white-hot ingot was shipped 200 miles in an open railroad flat-car, and lost less than 200 degrees on the way. The car was insulated with Vermiculite, a mica-like mineral. Dominion Iron and Steel, Ltd., shipped the 65-ton ingot from its Sydney, Nova Scotia, plant to Trenton, N. S. The big ingot started its journey at over 1600 degrees F.

Shipping ingots at such high temperatures saves about two months' processing time. Normally, it would have taken six weeks to cool the ingot before it could be shipped. And it would have taken another 10 days to heat it back to a workable temperature at Trenton.

College Profs Offered One-Year Refresher Course in Industry

Many company executives feel that the colleges would do a better job of providing quality leadership for industry if they more clearly understood industry's problems. And not those problems as they used to be, but as they are and as they will be.

Last month, Granville M. Read, chief engineer at Du Pont, told what he and his company would do about the situation. Speaking at

the Second Industry-College Conference of the Case Institute of Technology, he offered to take several professors from engineering schools and give them a year's experience in all phases of Du Pont's engineering program, paying them their regular salaries plus expenses.

Mr. Read feels that professors given this training will be better able to pass on to their students a "professional approach to problems"—better able to impress upon them the way the industries in their chosen fields really operate.

"This is no Santa Claus proposition," Mr. Read said. The details of how many professors will be chosen, and where and when, have not been worked out, but he said: "This is a sincere and earnest offer of one practical way to better understanding for mutual benefit."

Quality Control as a Human Relations Tool

Ford Motor Company now uses quality control charts to create real job interest among its employees. The chart "score cards" are put right at the workplace, kept up to date by frequent postings. Here's what Roscoe Smith, Ford's director of quality control, has to say about the system:

"Before Chart Control was introduced a man went along for days and weeks, maybe months, turning out the same identical part. His work was inspected. Some of his output was accepted and some was rejected. He didn't know whether the rejections were his fault, or whether the fault of the machine or the material. He didn't know how his output compared in quality to that of the man across the aisle. In other words, he didn't know the score. And since he didn't know the score, how could he possibly have any real interest in his performance?

"But put a score card on that man's activity and see what a difference it makes!

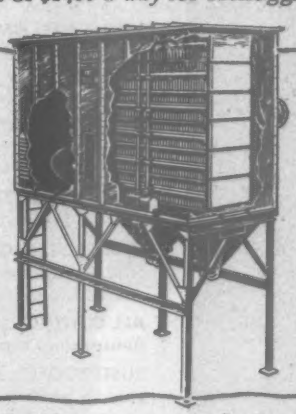
"When his chart shows the quality of his job going out of control, he knows it's time to do something about it. He feels it's up to him to improve it. He gets a kick out of tackling his own problems and suggesting from his own experience what can be done to make the job better. Instead of just working eight hours a day at a monotonous job, he is striving eight hours a day for self improvement. His morale rises with the challenge, and he has reason for his enthusiasm.

More on next page

* At the Kellogg Company of Battle Creek, Mich., this Pangborn Dust Control system salvages 35 tons of valuable dust per day. Collected from the corn mill and the Gro-Pup building, the dust is valued at $40 a ton . . . building a profit of *$1400 a day* for Kellogg!

Here's how Pangborn makes Dust Control *profitable* for industry!

Pangborn Dust Collectors make low-cost dust control possible. As this cutaway shows, type "CH" Collectors are compact, offer maximum filtering area in a given size. Filter life is prolonged because dust-laden air passes through collector at low velocity. Efficiency is extremely high; in fact, clean exhausted air can often be returned direct to plant.



FIND OUT how Pangborn Dust Control *turns dust into profits.* Write for a copy of Bulletin 909A to: PANGBORN CORPORATION, 2100 Pangborn Blvd., Hagerstown, Maryland.

Look to Pangborn for the latest developments in Dust Control and Blast Cleaning Equipment

STOP THE DUST HOG from stealing profits with

Pangborn

DUST CONTROL

Fig. 0611, 1BBM Wedge Gate Valve, Working Pressures: 125 lbs. Steam, 200 lbs. WOG.

KENNEDY JOB-FITTED

Iron-Body Wedge Gate Valves

YOU SAVE TIME AND MONEY all along the line with Kennedy iron-body wedge gate valves because they are JOB-FITTED . . . every valve specially designed and engineered for the job it has to do.

THE WEDGE DISC is a cored casting of thick metal section, reinforced by integrally-cast interior posts and provided with openings to drain in any position.

HEAVY BRONZE DISC RINGS are forced into dovetailed grooves in the disc in a practically inseparable construction.

HIGHER STRENGTH IRON in the body and bonnet is actually 50% stronger than ordinary cast iron . . . and far exceeds A.S.T.M. requirements.

ALL CONTACT SURFACES between moving parts are bronze-to-bronze to assure easy operation.

RUSTPROOFED STEEL BOLTS AND NUTS have ample clearance to prevent distortion. Open-end wrenches may be used . . . no need for special tools. Valves can be repacked under full pressure.

EVERY FEATURE of the valve helps it do the job better . . . gives you a solid guarantee of economy and dependability whenever you install one of these Kennedy Job-Fitted Wedge Gate Valves.

BUY FROM YOUR LOCAL DISTRIBUTOR

WRITE FOR BULLETIN 107

Est. 1877

THE KENNEDY VALVE MFG. CO. • ELMIRA, N.Y.

VALVES • PIPE FITTINGS • FIRE HYDRANTS

YOU MUSTN'T MISS—

Begins on page 222

QUOTES

Does the Shoe Fit?

"People are very open-minded about new things — as long as they're exactly like the old ones." —Charles F. Kettering, General Motors research genius.

How Not to Treat Labor Leaders

"It would be dubious wisdom to train a dog to bite less, solely by kicking him daily. Yet that is the technique followed by a good number of captains of industry insofar as they consciously or unconsciously endeavor to keep labor leaders in an inferior status.

"The typical business executive regards himself as a man of vast and ineffable superiority, which he may be. He peers down upon the union leader who represents his employees, or any segment of them. In the executive's eyes, the union leader, if he represents shop labor, is on a par with shop laborers; if he represents the truck drivers of the company, then the union head is the equivalent of a truck driver.

"The labor leader has no social acceptance. Despite his wealth and power, the fruits of his position are denied him. Anywhere he goes outside of his circle, he finds only a depressing inferiority, only a chilling half-welcome.

"In (conscious or unconscious) retaliation, many of these labor leaders indulge in strikes, arbitrary demands on working conditions, capricious demands 'to see the company books,' and so on.

"The danger of our present employer conduct is that we may get a government in this country, as in England, bitterly dedicated to sap the energies and strength of business under the guise of a planned economy and a welfare state. One cannot expect that labor leaders who are made to feel like

Jones

Herringbone SPEED REDUCERS

Single, double and triple reduction units cover every requirement in drives from 1 to 400 horsepower. Ratings and standard ratios from 1.25 to 1 to 355.8 to 1 are all shown in Catalog No. 70.

Since 1890

Jones

In The Service Of Industry

HERRINGBONE — WORM — SPUR — GEAR SPEED REDUCERS
CAST IRON PULLEYS • CUT GEARS • V-BELT SHEAVES
ANTI-FRICTION PILLOW BLOCKS • FLEXIBLE COUPLINGS

DUST CONTROL

DUSTUBE closes the windows to heat loss

AND SAVES $6,000 yearly
for GRAND RAPIDS STORE EQUIP. CO.

Installation of Dustube Collectors solved a heating and dust problem and saved $6,000 yearly for the Grand Rapids Store Equipment Co., Grand Rapids, Mich. Previous cyclone collectors partially removed the dust created by wood working operations . . .but also removed 70,000 cu. ft. of warm air per minute along with it. Due to the low efficiency of the units none of this air was returned to the plant so it had to be replaced from outside the building. This necessitated the use of window heaters to temper the huge quantities of cold air drawn into the plant in cold weather.

Now with the Dustubes, most of the window heaters are eliminated.

The Dustubes filter the dust laden air and clean it so efficiently it can be returned to the plant . . . with practically no heat loss. In addition the collected wood dust is fed directly to the boiler room and is used as heating fuel.

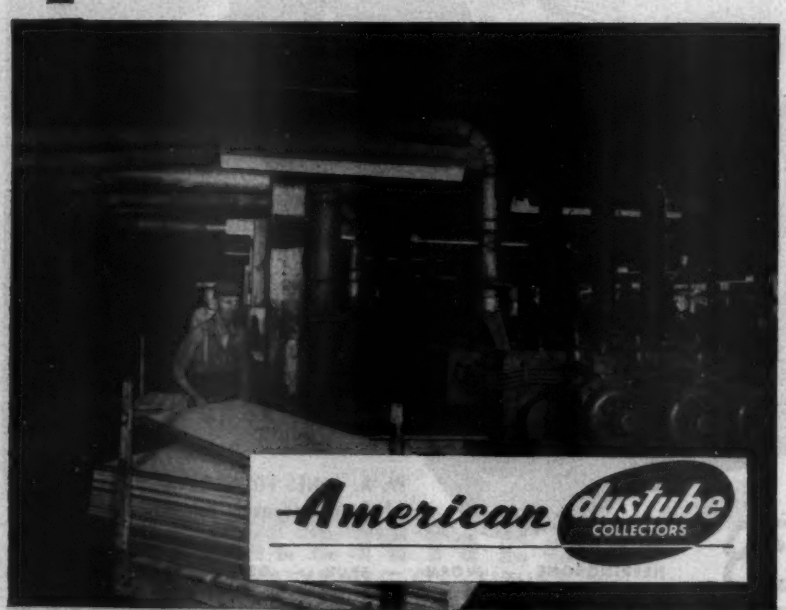
Though a cost study has not been made, Mr. C. D. Stratton, Maintenance Superintendent estimates that a saving of 33% in fuel consumption will be effected.

The Dustube brought about other savings too. Plant maintenance has been reduced as there is no longer a vacuum created inside the plant to play havoc with the building.

Community relations have improved and all complaints have stopped as dust is no longer exhausted into the atmosphere.

Working conditions and production efficiency have been improved due to the elimination of the dust nuisance and the rearrangement of their production machinery to provide a better flow of work.

You, too, can put your dust collection on a paying basis with a Dustube. Write today for full details.



AMERICAN WHEELABRATOR & EQUIPMENT CORP., 374 S. Byrkit St. Mishawaka, Ind.

YOU MUSTN'T MISS—

Begins on page 222

social untouchables, would not upon achieving power, strike back at their tormentors."

A. A. Imberman, public relations counselor, speaking before the Industrial Management Conference at the Univ. of Missouri.

Pull on Your Own Reins

"I think it is important, above all other needs of our time, that additional ways be found to encourage the bringing together of discordant groups for voluntary cooperative action. There are evidences here and there that small starts have been made, but the times are too perilous for timid action.

"This is a job that needs to be done outside of government. Let's quit leaning on our national government and awaiting so-called 'fact-finding' boards to solve or confuse our problems.

"Let's stop relying on government action to force on us either restraints, or the concern for our fellowman, which a mature, responsible member of a free society should voluntarily impose on himself."—*Frank W. Abrams, chairman of the board, Standard Oil Company of New Jersey.*

In Defense of the Dollar

"Inflation is a grave injustice and a serious danger to our free economy. It injures most the aged, the pensioners, the widows, and the disabled, the most helpless members of our society.

"It diminishes the desire to work, to save, and to plan for the future.

"It causes unrest and dissension among the people and thereby weakens our productivity and hence our defense effort.

"It imperils the existence of the very system that all of our efforts are designed to protect. The dollar must be defended. To do otherwise would be a great tragedy."—*Marriner S. Eccles, member of the Board of Governors of the Federal Reserve System.*

"Wanted—

"— a man for hard work and rapid promotion.

"A man who sees things to do

Count on this attractive,
unit-laid industrial floor
to live up to its name...TOUGH!

Look for exceptional traffic resistance.
Expect a long life...even under rugged
abuse from materials-handling trucks.

Tuff-Tex can *Take it...*

...in Plant Work Areas and Traffic Aisles

Most plants have floor problems . . . until they install Tuff-Tex* greaseproof industrial flooring. This specially designed factory flooring in tile form is just as tough as its name. It will withstand the two main enemies of an industrial floor—greases and oils, and the constant movement of materials throughout the plant.

Tuff-Tex has a smooth, closely textured surface which, coupled with its high grease resistance, makes cleaning simple and economical. Daily sweeping to remove loose dirt plus periodic washing are all that are necessary. Since Tuff-Tex is unit laid, it can be repaired quickly and inexpensively without costly interruptions to manufacturing operations.

Tuff-Tex floors are not only attractive . . . but versatile. You can design them for decorative or functional purposes to outline shipping areas, traffic aisles, material bays, etc. Tile-at-a-time installation and good color range give you *endless pattern possibilities.*

Your local Tile-Tex Contractor will give you product data, estimates, and suggest designs. If he is not listed in your classified telephone directory, write THE TILE-TEX DIVISION, The Flintkote Company, 1234 McKinley St., Chicago Heights, Ill.

*REGISTERED TRADEMARK, THE FLINTKOTE COMPAN

Plastic TILE-TEX Tile

Tuff-T

Get power faster...
WITH
Ramset
FASTENING SYSTEM

Fastening bus ducts, wiring and other electrical services into steel or concrete, can be done far faster with the high-speed RAMSET FASTENING SYSTEM. Requiring less than a minute per fastener, from start to finish, RAMSET does the work in minutes instead of hours, at far less cost than conventional methods. This same speed can be applied to the 1000-and-1 jobs calling for anchoring into structural materials.

The light, powerful, self-contained RAMSET TOOL is easy to operate. Exclusive *tap* or *turn* DUAL-ACTION gives a choice of operating methods. Improved ROTO-SET SAFETY SHIELD locates the fastener exactly where you want it, with pin-point accuracy. A wide range of sizes and types of fasteners, from 1" to 6" long, and graded power charges, fit RAMSET SYSTEM to practically any kind of work.

See DUAL-ACTION in ACTION!

Ask your local RAMSET Specialist for a demonstration and full details, or write us. Be sure to use only genuine RAMSET products for fast, economical fastening. *Ramset Fasteners, Inc., 12117 Berea Road, Cleveland 11, Ohio.*

FASTEN FASTER WITH Ramset System
FASTENING SYSTEM
Pioneer in powder-actuated fastening

YOU MUSTN'T MISS—

Begins on page 222

without the help of a foreman and three assistants.

"A man who gets to work on time in the morning and does not imperil the lives of others by being the first out of the building at night.

"A man who is neat in his appearance.

"A man who does not sulk when he is working a little overtime in emergencies.

"A man who listens carefully and asks only enough questions to insure carrying out instructions.

"A man who moves quickly and makes as little noise as possible.

"A man who looks you straight in the eye and tells the truth every time.

"A man who does not pity himself for having to work.

"Apply anywhere—the world is looking for such men."—*Spaulding Times.*

Mobilization and Your Personnel Program

"We are going to be faced with all the government controls that you have ever heard about. Strangely enough management will be blamed for the controls and restrictions.

"There are (or will be) price and wage controls; high personal income taxes; the freezing of critical skilled labor; Universal Military Training; and a large number drafted under Selective Service.

"There will be limitations on the placement of professional and scientific personnel.

"There will be a further limitation on free collective bargaining.

"Let me repeat: Management is going to be blamed for these things. Why? Because we are not in a total war. We won't have the patriotic fervor of defending our country that we have during a total war. What we are going to experience instead is a feeling on the part of workers that they are having to do things that they don't want to do.

"We have to guard against this and take steps to assure that employees know why there are controls and restrictions."—*Guy B. Arthur, Jr., president, Management Evaluation Services; speaking at California Personnel Management Conference, October, 1950.*

More on next page

"Job-Engineered"
means tailored to your crane needs

When you buy a crane, you want dependable service for many years to come. Your P&H "Job Engineered" crane will be built to meet your requirements to insure dependability . . . ample reserve capacity . . . adequate service factor . . . maximum safety. All P&H electrical equipment is designed and built by P&H for crane service — not adapted for it.

"Job Engineered" is an Added Value which comes with P&H's 65-year experience in crane-building — to serve your needs *exactly*.

And here's a fact worth remembering: P&H Cranes are sold and serviced by factory-trained men — not agents.

P&H Magnetorque* is the greatest advancement in AC crane control in the past 40 years. Ask about it.

*T. M. of Harnischfeger Corporation for electro-magnetic type brake.

P&H

OVERHEAD CRANES
4525 West National Avenue
Milwaukee 14, Wisconsin

HARNISCHFEGER CORPORATION

EXCAVATORS • OVERHEAD CRANES • HOISTS • ARC WELDERS AND ELECTRODES • SOIL STABILIZERS • CRAWLER AND TRUCK CRANES • DIESEL ENGINES • CANE LOADERS PRE-ASSEMBLED HOMES

Write for your copy of Bulletin C-39 describing P&H Magnetorque control.

OVER 17,000 P&H CRANES SERVE AMERICAN INDUSTRY . . . FAR MORE THAN ANY OTHER

IT'S LIGHTER!
Not woven, not welded, but sturdy, solid steel, pierced and s-t-r-e-t-c-h-e-d from a single plate! It's a wrought steel grill lighter yet stronger than any fabricated grill!
IT'S STRONGER!
Solid steel you can see through—and, because it's solid, a stronger steel for any application that requires free passage of light and air: for partitions, grills, window guards...
IT'S SAFER!
Because it's stronger, lighter, has a natural non-skid surface, Wheeling Expanded Metal is ideal for safety installations: walkways, stair treads, platforms...Use it all ways!
For full engineering data, write us today!
IT'S WHEELING EXPANDED METAL!
Wheeling
WHEELING CORRUGATING COMPANY
WHEELING, WEST VIRGINIA
Atlanta Louisville Boston Minneapolis Buffalo New Orleans Chicago New York Columbus Philadelphia Detroit Richmond Kansas City St. Louis

YOU MUSTN'T MISS—

Begins on page 222

Don't Waste Men on a Machine's Job

"Manpower will be too scarce in the months ahead to waste it on jobs that can be done mechanically. Heavy lifting and moving of materials is a type of work that can be almost completely eliminated. It must be mechanized now because labor will be short and those who will be added to the working force will be those least capable of doing heavy work. Machines must free employees for productive activity."—*L. B. McKnight, president, Conveyor Equipment Manufacturers' Association.*

...For Small Favors

"One of the things we should be thankful for is that we don't get as much government as we pay for."—*Washington Times-Herald.*

An Honest Promise

"... the techniques of mass production unleashed by the Americans 40 years ago promise comfort to all—and the promise is an honest one, technically redeemable. This promise runs through the world like a Pied Piper, leading men to drop ancient ways of life and follow it."—*Time.*

"If I Were a Communist Spy...

"... assigned to come over here and launch a program to do the maximum harm to the United States, I would plan a subtle campaign to turn the public against the American business system and to create dissension in the business machine itself, so that the various elements would begin to quarrel with each other instead of being partners and team-mates."—*Henry B. duPont, president, E. I. duPont de Nemours & Co.*

How to Lose Out

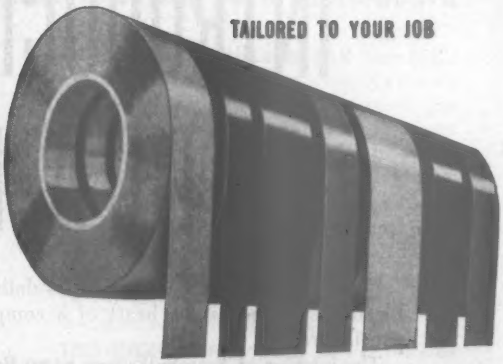
"No war, no strike, no depression, can so completely destroy an established business or its profits, as new and better methods, equipment and materials in the hands of an enlightened competitor."—*The Society for the Advancement of Management.*

THE NEW

Polyken®

INDUSTRIAL TAPES

TAILORED TO YOUR JOB



Fifteen levels below ground an air "life line" is sealed with new *Polyken* No. 822 polyethylene tape.

A tape that helps men breathe ... a mile underground

This is the story of how a new kind of tape helps get air to men a mile down under Kellogg, Idaho, in the Bunker Hill Mine.

Fresh air is forced under pressure in 16" ducts through miles of underground tunnels. Naturally, duct joints must be tightly sealed or leaks develop and endanger lives. Tape is the fast, economical way to do this, but no tape could be found that would long resist the acids and fungus and the intense humidity of the underground without rotting or cracking.

Our engineers recommended *Polyken* No. 822. One of our 129 special tapes, No. 822 has a polyethylene backing (an elastic plastic). Not only does this tape conform to irregular surfaces, it keeps its high adhesion and tension indefinitely . . . even under conditions as unfavorable as those at the Bunker Hill Mine.

This is just one instance of how a tape that's "tailored to your job" can save you time and money —and in a case like this, maybe even a life! *Polyken* is the leader in this field, and we make this challenge: Let us study your particular problem. Nine out of ten times we'll come up with a tape that will do the job better, cheaper, and with less effort!

GET THIS FREE BOOKLET! To help you find the tape "tailored for your job," write for your free copy of "Tape is a Tool." Address *Polyken*, Dept. FMC 222 W. Adams Street, Chicago 6, Illinois, or see your *Polyken* distributor.

Polyken Industrial Tape, Department of Bauer & Black, Division of The Kendall Company

INTRODUCING A PANELBOARD WITH A PLASTISOL HEART

Now—for the first time—a new insulating material, Plastisol, is used as the heart of a complete line of panelboards.

The interior of Trumbull's new NLTQ Panelboard is formed with bus bars *molded in* a plastisol base. This plastisol material has many advantages over all other types of insulation: highly resistant to either acid or alkali; no harmful aging; no shrinking or embrittlement; highly resistant to tracking and carbonizing; will withstand temperatures of 212 F without harm; has very high thermal conductivity (even at minus 30 F) and is an excellent radiator of heat. Tests show copper bus bars encased in plastisol run 10% cooler than in open air!

Trumbull's plastisol base is Underwriters' Laboratories, Inc. approved, and is completely endorsed by The Electrical Council.

The NLTQ Panelboard is furnished with lug-in mains or circuit breaker mains in capacities up to 225 ampere bus bars, in a range of 4 to 42 circuits. 3-wire, 120/240 volt A-C or 4-wire, 3-phase, 120/208 volt A-C, solid neutral. Provision can be made for increasing any bus capacity up to 210 amperes; also sub-feed, meter loop, through feed and split bus. ***Write for Bulletin TEB-14.***

NEW INTERIOR SAVES INSTALLATION TIME, PROVIDES SEQUENCE PHASING

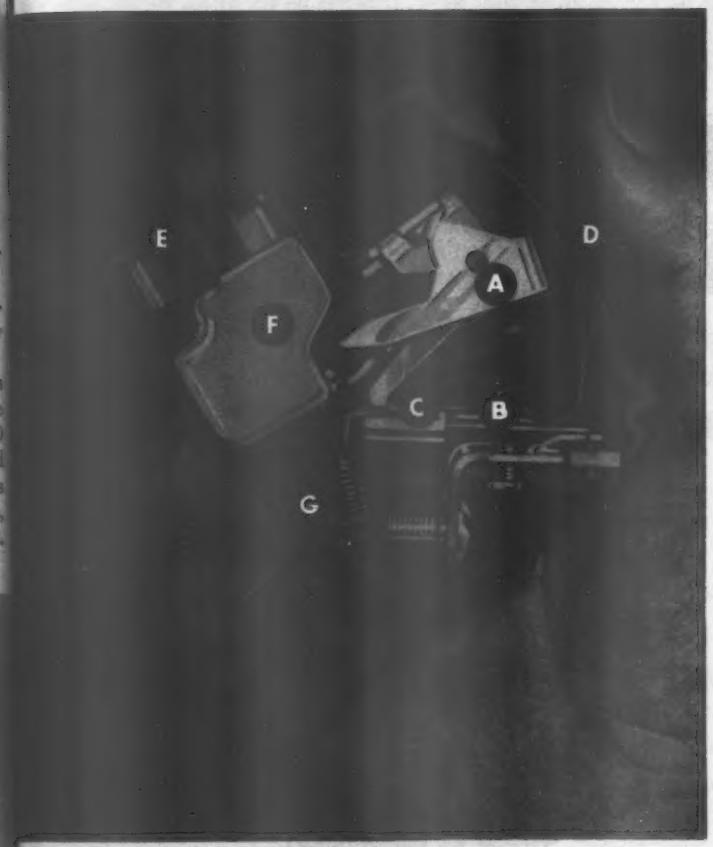
The interior is compact, allowing ample room for wiring. As shown in the picture at the right, it is mounted in the box by means of four posts and compression springs; this speeds installation, permits removal for ease in wiring.

The bus bar and stab assembly is silver-plated copper for positive conductivity. Line terminals are heavy-duty, silver-plated, solderless.

Another unique feature of this interior is that by ingenious design, sequence phasing is built into the Panelboard. Each adjacent Breaker is on an alternate phase, which assures balanced loads and circuits.

Phases are permanently identified by molded-in letters.

ou've never before seen a CIRCUIT BREAKER like this in a panelboard



QUICK-MAKE, QUICK-BREAK Trumbull's new TQL interrupts with a *snap*. No matter how sloppily the handle is operated, the movable contact arm (A) opens or closes *fast* and *clean*... reduces burning or arcing of contacts.

DOUBLE PROTECTION *thermal and magnetic* Trumbull's new TQL trips automatically by (B) time-delay thermal action of excessive overload (but not by harmless temporary overloads) or by (C) instantaneous magnetic action for short circuit.

TRIP-INDICATING When an overload or short circuit causes the Breaker to trip, the handle (D) moves to mid-position between OFF and ON where it is easily observed from a distance.

TRIP-FREE Trumbull's new TQL Breaker automatically trips independently of the handle—it trips for a fault condition even though handle is held in ON position.

OTHER FEATURES Pressure-type silver-plated copper contacts (E)... arc chute (F) made of special refractory material . . . exhaust chamber (G) to cool gases . . . completely tamper-proof . . . Underwriters' Laboratories Inc. approved.

INTERCHANGEABLE All ampere ratings are physically interchangeable.

RATINGS 15, 20, 30, 40, 50 amp; 120 volt A-C, single pole, single throw. Interrupting: 5000 amp. 120 volt A-C, 120/240 volt A-C. Two-pole operation, independent trip, possible with handle extensions.

OMPRESSION SPRINGS save nui-ce of nuts and washers, allow fronts e lined up regardless of uneven box tallation.

ONE-PIECE WELDED ASSEMBLY of front and barrier saves installation time. Front is attached to interior by means of four screws.

COMPLETELY PROTECTED With door locked, screws are concealed, front cannot be removed. Note attractive appearance; invisible hinges.

TRUMBULL (T) ELECTRIC

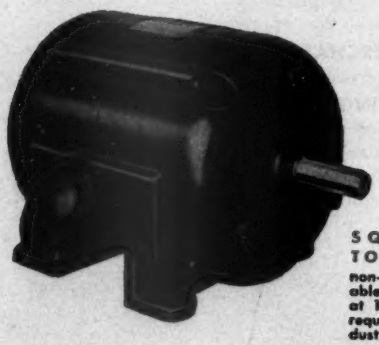
THE TRUMBULL ELECTRIC MANUFACTURING COMPANY

PLAINVILLE, CONN.

The RIGHT motor

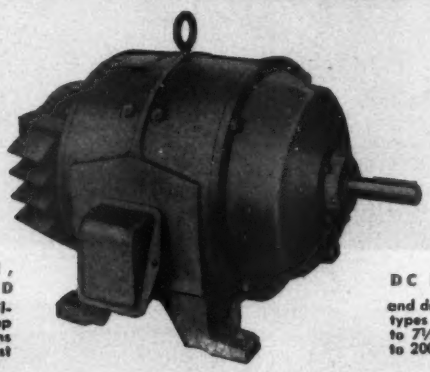
SQUIRREL-CAGE SPLASHPROOF

Form BA. Has corrosion-resistant covers which prevent entrance of splashing liquids.



SQUIRREL-CAGE, TOTALLY-ENCLOSED

non-ventilated Form BE. Available up to and including 3 hp at 1800 rpm, for applications requiring protection against dust, fumes, moisture.

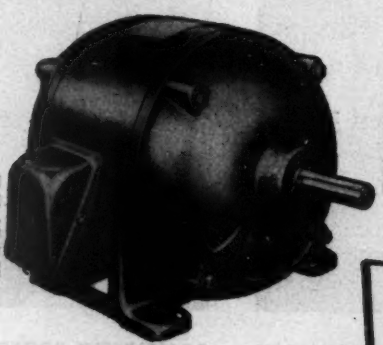


DC DRIPPROOF

and drippproof-protected types Form F, in ratings to 7½ hp. Form H, 10 to 200 hp.

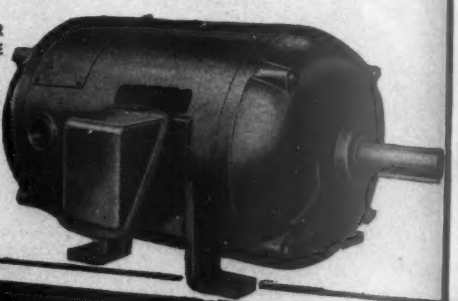
SQUIRREL-CAGE PROTECTED TYPE

Form BA. An open drip-proof motor for general purpose use. Available in wide modifications to meet a variety of conditions.



WOUND-ROTOR PROTECTED TYPE

Form BW. For slow, smooth acceleration, high starting torque with low starting current, or variable speed. Drip-proof, splash-proof, 1 to 200 hp.



Other Elliott products include:
Turbine-Generators • Deaerating Heaters • Generators • Turbochargers • Strainers • Centrifugal Blowers • Condensers • Mechanical Drive Turbines • Steam Jet Ejectors and Tube Cleaners.

ELLIOTT COMPANY

General Offices & Main Plant—Jeannette

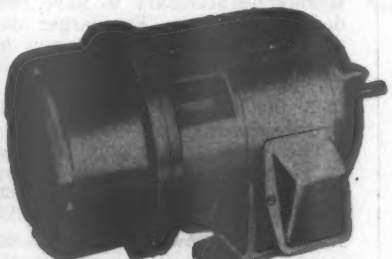
does the job better!

"SEALEDPOWER"

totally-enclosed fan-cooled squirrel-cage motors, 3 to 125 hp. Also explosion-proof underwriter's-approved, 20 to 125 hp. Cooled by air blown along the finned outer case.

MILL MOTOR,

W600 Series, DC. Conforms in all respects to AISE standards. Offers more power without increase in frame size.



BRAKE MOTOR using latest disk type brake mounted on BA dripproof motor. Also available with totally enclosed and splashproof enclosures for AC or DC applications.

Take your pick of these ELLIOTT CROCKER-WHEELER INTEGRAL MOTORS

from 1 to 200 hp

■ NAME YOUR POISON—is it dust, dirt, corrosive fumes, explosive hazard, water in fog, in drops, in a deluge—is it heavy duty, normal duty, limited motor space, high starting torque, etc., etc. Whatever the condition, an Elliott Crocker-Wheeler motor will prove itself the *right* one for the job—*right* not only because it is designed for the conditions of your drive, but also because it has behind it names that for many years have meant quality motor performance.

GET FULL INFORMATION about the C-W motor you need. Tell us your drive problems and we will be glad to send informative bulletins on the motors indicated.

NEED LARGER MOTORS? Looking for a really big motor—big in quality as well as capacity? You'll find it in the Elliott "Fabri-Steel" line, which employs the modern technique of electric welding in the achieving of greater strength, rigidity, lightness, and adaptability, with long life and easy maintenance. Bulletin on request.

Address Your Request for Bulletin to
Dept. F, ELLIOTT COMPANY, JEANNETTE, PA.

CW-22

CROCKER-WHEELER DIVISION
AMPERE, N. J.

BRANCH OFFICES AND REPRESENTATIVES IN PRINCIPAL CITIES
ELLIOTT Approved SERVICE SHOPS COVER THE COUNTRY

1901 1951

Preformed "HERCULES" (Red-Strand) Wire Rope and Wire Rope Slings are designed and manufactured to meet the ever-present and all-important consideration—Safety.

Preformed "HERCULES" RED-STRAND WIRE ROPE & WIRE ROPE SLINGS

® REG. U.S. PAT. OFF.

Safety is a MUST!

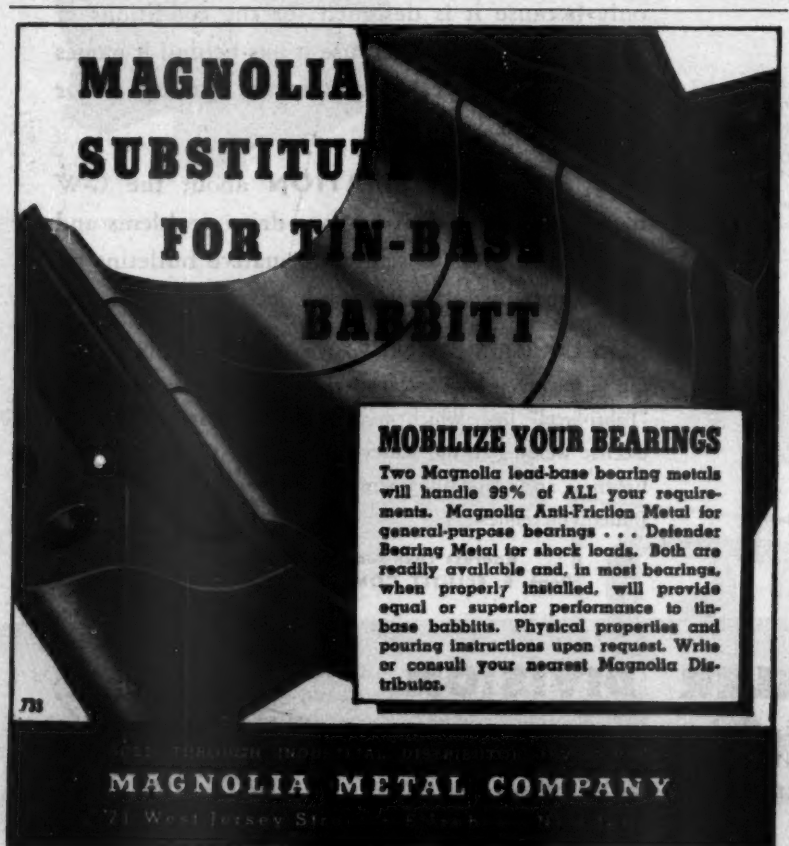
To obtain and maintain maximum safety, many factors must be considered. We shall be glad to help solve *your* material handling problems. Write to our Engineering Department—without obligation, of course.

MADE ONLY BY

A. LESCHEN & SONS ROPE CO. 5909 KENNERLY AVE. • ST. LOUIS, MO.

ESTABLISHED 1857

New York 6 · Chicago 7 · Birmingham 6 · Houston 3 · Denver 2 · Los Angeles 21 · San Francisco 7 · Portland 9 · Seattle 4


MAGNOLIA
SUBSTITU
FOR TIN-BA
BABBITT
MOBILIZE YOUR BEARINGS
Two Magnolia lead-base bearing metals will handle 98% of ALL your requirements. Magnolia Anti-Friction Metal for general-purpose bearings . . . Defender Bearing Metal for shock loads. Both are readily available and, in most bearings, when properly installed, will provide equal or superior performance to tin-base babbitts. Physical properties and pouring instructions upon request. Write or consult your nearest Magnolia Distributor.
MAGNOLIA METAL COMPANY

WASTE REDUCTION TRAINING MANUAL

With this training manual Maiden Form uses the multiplier system to train old employees. See page 94 for the Maiden Form story.

THIS OUTLINE is only a framework within which the department head will work. The technique to be used involves having supervisors take active part in instructor-learner demonstrations in front of their co-supervisors so that real on-the-job training problems are enacted. Each observer lives through the problem and discusses the various angles.

The attitude and vitality of the department head is still the most important factor in making these sessions a success. The 'role-playing' device should enable the supervisor to gain skill through doing, through practice, and through repetition, but it is still the department head's job to follow up on these conferences. Department heads must 'know that the supervisor knows' and then see to it that the supervisor practices what she knows.

The suggested size for each group is from 6 to 8 members and the department head. Since some departments have fewer supervisors, it may be necessary to have two departments join. For larger departments, it may be necessary to split into groups of 6 to 8. In this way it should be possible to complete the meetings in from two to four sessions.

The following key points should be given special attention by the department head in preparing for the conference:

1. Limit your own speaking to an absolute minimum (approximately 25% of the hour). Guide the group, but remember that better participation is achieved if the supervisors do the talking and working out of the critique of the conference.
2. Include *all* personnel in the role-playing either as instructor or learner.
3. Read this outline through completely several times so that you may use it only as a reference. *Use your own words.*

More on next page

NEW Easy to Clean Resists Corrosion

CORROSIVE ATMOSPHERES CAN'T HURT this Allis-Chalmers totally enclosed, fan-cooled motor because major parts are enclosed in a rigid corrosion resistant cast iron frame! No extra treatment is needed and cast iron's corrosion resistance won't chip off.

Lower Maintenance, Too

No corners, pockets or hidden air passages to collect dirt. Cleaning is the simplest of maintenance operations. Just blow off the dirt with an air hose. Fan and housing design keep cooling airflow tight against the yoke so dirt does not accumulate and cleaning is seldom required.

Factory Lubricated Bearings

Bearings are lubricated at the factory and operate without attention or cost for years. Extra rigidity of the cast iron frame holds bearings in true alignment under all operating conditions. This gives long bearing life and low operating costs.

Get All The Facts

The new *Safety Circle* totally-enclosed fan-cooled motor is built in all NEMA standard frame sizes from 224 to 505. Call your nearest Allis-Chalmers Authorized Dealer or Sales Office for complete information or write Allis-Chalmers, Milwaukee 1, Wisconsin. Ask for Bulletin 51B6144. A-3220

Safety Circle, Texrope and *Vari-Pitch* are Allis-Chalmers trademarks.

Sold . . .
Applied . . .
Serviced . . .

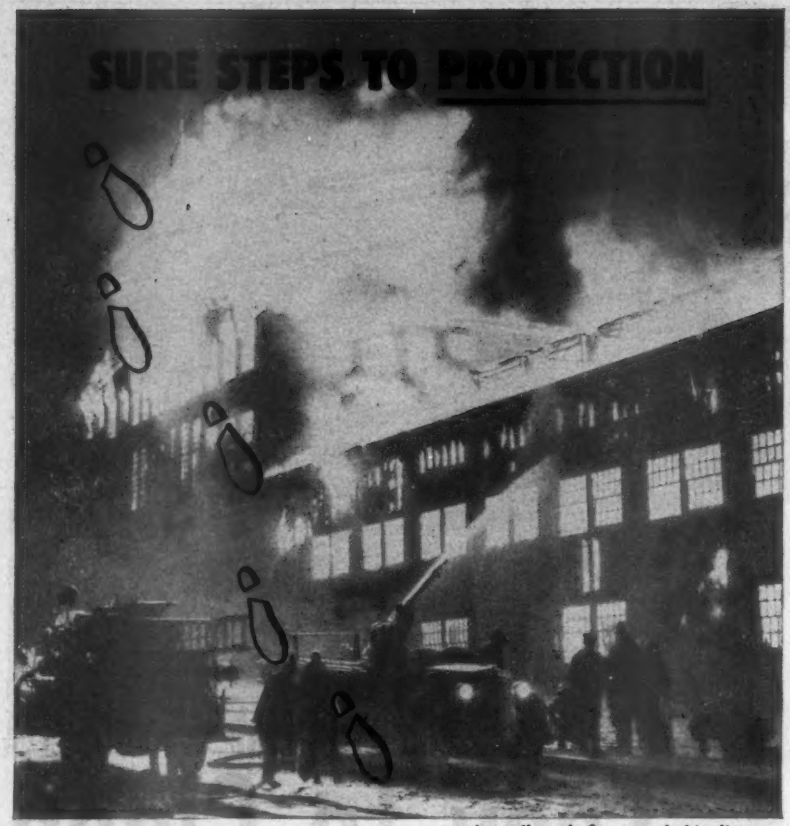
by Allis-Chalmers Authorized Dealers, Certified Service Shops and Sales Offices throughout the country.

CONTROL — Manual, magnetic and combination starters; push button stations and components for complete control systems.

TEXROPE — Belts in all sizes and sections, standard and *Vari-Pitch* sheaves, speed changers.

PUMPS — Integral motor and coupled types from ¾ in. to 72 in. discharge and up.

ALLIS-CHALMERS



A small trash fire started this disastrous fire at the Iron Fireman Manufacturing plant in Portland, Oregon, on February 2, 1944. Loss between $2,500,000 and $3,000,000.

Underwriters' Laboratories Approved
STAINLESS STEEL EXTINGUISHERS
Portable Foam, Soda-Acid and Clear Water Cartridge Type in 2½ gal. sizes.

BUFFALO better-built

STAINLESS STEEL FIRE EXTINGUISHERS

Disastrous industrial fires originating from wood, paper, cloth, trash, etc., can be stopped when they start by quick action with Buffalo Stainless Steel Extinguishers. And "quick action" is easy when Buffalo Stainless Steel Extinguishers are close by. They are easier to handle because their stainless steel construction makes them one-third lighter than old style extinguishers.

Order Buffalo fire protection today! Consult your Classified Telephone Directory or write for your nearest Buffalo representative.

BUFFALO FIRE APPLIANCE
CORPORATION
DAYTON 1, OHIO

MANUAL . . . *begins on page 248*

4. Read and thoroughly know the seven pages on "How to Instruct."

The outline uses the following format:

1. Roman letters indicate actual statements.
2. *Italic letters are directions to the department head.*
3. Boxes indicate blackboard work (where possible).
4. **Minutes show cumulative elapsed time.**

FIRST SESSION

We have all discussed the importance of job instruction training before, but the need to reduce waste in the manufacture of Maiden Form brassieres brings us back to reconsider more applications for good training methods.

Job training has meant the training of new employees to many of you. It is true that all new employees must be trained, but it is equally true that experienced workers frequently are taught new jobs, or are taught to do the same job differently.

Progress requires that changes be made in jobs and procedures. New improved methods are introduced.

Job training is also important to the regular operator who has incorporated an error into her work and needs retraining and correction of her work habits.

Job training is a tool for waste reduction. We know that there is waste at Maiden Form, and studies have shown that 80% of all waste is due to human failure and only 20% to machine or other failures. Human failure can be defined as people doing the wrong thing for one of the following reasons:

1. They don't know
2. They don't care
3. They are unable

Workers who fail to operate properly require supervisory attention. If they:

1. Don't know—Instruct, show how
2. Don't care — Improve attitude by retraining
3. Aren't able—Investigate

Regular instruction or training, which is defined as a continu-

More on next page

EVER SHAKE HANDS WITH A DOOR?

One of civilization's most important, most *used* inventions is paradoxically one of its least appreciated. Few manufactured objects have such close, subconscious, personal meaning to every individual as do the doors in his life. More than a million times in his lifetime, his entrances and exits, his privacy or his hospitality are all tied in with doors.

To each, there are some doors that hold particular significance. Whether at home, church, school, or business, they are deep in special meaning. Through the centuries, from the earliest recorded time, doors have played a fascinating part in the unfolding drama of civilization.

Statisticians estimate that there are nine doors for every man, woman and child in the United States—twelve or more in the average house. Helping to supply this need, Georgia-Pacific manufactures 5,000 doors of all types per day—over a million a year. These are panel doors and flush doors in soft and hardwoods, for indoor or outdoor use, garage doors, screen doors and sliding doors. G-P doors represent about ten per cent of Georgia-Pacific's volume. They are an important part of the "New Dimension" of quality products and nationwide services that bring you forest products more efficiently, more economically.

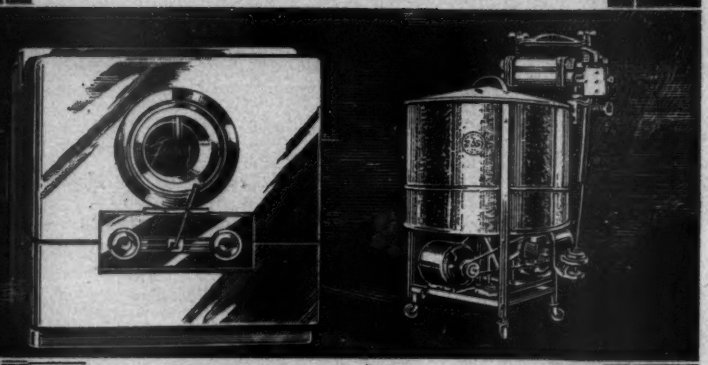
BUSINESS EXECUTIVES—*For a modern approach to plywood, lumber and door buying, write on your company letterhead for a copy of this 20-page full color booklet—A "New Dimension," Georgia-Pacific Plywood & Lumber Co., 608 North Capitol Way, Olympia, Wash.*

GEORGIA—PACIFIC

PLYWOOD & LUMBER CO.

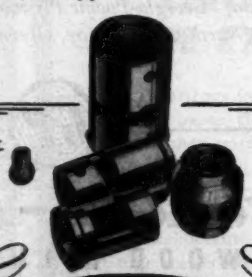
OFFICES OR WAREHOUSES IN: Augusta, Birmingham, Boston, Chicago, Columbia, Louisville, Memphis, Nashville, Newark, Olympia, Philadelphia, Portland, Raleigh, Richmond, Savannah

JOHNSON BEARINGS
1901-1951



These Fifty Years Have Seen Progress in Sleeve Bearings, Too

GREAT IMPROVEMENTS have been made in all mechanical equipment during the past half century. New inventions have changed our way of life. It may not have occurred to you but similar progress has been made in Johnson Sleeve Bearings too! Alloys have been improved, standardized and refined. Precision has become more and more important. New types of sleeve bearings have been developed—graphited bearings, steel and babbitt, bronze on sheet steel, powdered metallurgy, and aluminum alloys. Today's Johnson Bearings are the best and most precise ever made. Johnson's engineering advice to manufacturers has likewise been broadened and made more comprehensive. Why not consult with us on your next application?



SLEEVE BEARING HEADQUARTERS *Since* 1901

Johnson Bronze

512 SOUTH MILL STREET • NEW CASTLE, PA.

MANUAL . . . ***begins on page 248***

ing series of instructions, reduces human error. Each supervisor is expected to train her employees and thereby reduce human error.

Remember, if the learner hasn't learned, the instructor hasn't taught.

At Maiden Form, 2000 workers receive job training from 200 supervisors.

2000 Workers 200 Supervisors

What is waste time?

Get the group to explain the meaning of waste. Write their explanations on the board. Make certain that they realize that the cost of retraining an operator and correcting faulty work is waste.

1. ..... 2. ..... Etc.

Elapsed time, 10 minutes

In job instruction, when correcting an error or making an improvement, two things must be kept in mind:

1. Approach 2. Method of correction

The approach to correcting errors has been discussed before with Mr. Lateiner in his conferences on job relations. The factors to remember in employees are:

Discuss these points as you present them. Record the factors on the blackboard, in their abbreviated form, like the chart below. The full title of each category is given first and the numbers on the chart correspond to those on the list.

How to Eliminate Human Failure:

1. Use a very friendly approach.
2. Let the girl correct herself. If you ask the right questions the girl will come up with the right answers, and feel that she has thought them out for herself.
3. When mentioning errors, soften the blow by allowing the girl an out for herself.
4. Recheck for errors.
5. Give a lot of praise for a little improvement.

More on next page

STOP RUST WITH RUST-OLEUM

Why let rust—the most destructive enemy of American I[illegible] —rob you of [illegible] to-repl[illegible] stacks, fence[illegible] fire escapes, [illegible] equipment?

Use RUST-OLEUM in your plant to protect it. For 25 years RUST-OLEUM has proved its capacity to stop rust for many nationally known manufacturers. Its tough, pliable, rust-resisting film gives excellent protection that prevents rust losses under many difficult rust-producing conditions—salt air, dampness, industrial fumes, and general weathering.

RUST-OLEUM can be applied even over rusted surfaces. It is not necessary to remove all the rust. Just remove scale and loose rust by [illegible] and wire [illegible]

[illegible] rust problems and help you develop a program of plant-wide rust control to defer many costly replacements — to conserve the available supply of new metal for national defense.

Industrial Distributors in principal cities of the United States and Canada carry complete stocks for immediate delivery. Plan your needs—order *now!* See our complete catalog in *Sweet's* which also tells the nearest source of supply. Or, write on your company letterhead for full information.

Available in many COLORS aluminum and white

Beautifies as it Protects

RUST-OLEUM CORPORATION
2453 Oakton Street, Evanston, Illinois

MANUAL . . .*begins on page 248*

Eliminate Human Failure

What to do	How to do it
1. Friendly 2. Ask	Smile, ask, patient When a girl knows, then ? and permit self-correction
3. Save face	Transfer blame to machine, lighting, criticize privately
4. Check for error	Do it immediately and keep doing it before error gets to be habit
5. Praise	For effort rather than accomplishment

Cumulative time, 30 minutes

The basic factors involved in the method of correcting errors are:

Discuss these points as you present them. Record them on the blackboard. The supervisors must understand these factors if they are to practice them effectively.

The department head should use the material presented in the "How to Instruct" mimeographed pages. The table below gives the basic outline which should be put on the board, together with the appropriate abbreviations. The department head should use his own judgment in just what to put on the board under the column headed "How to do it."

4-STEP METHODS

Step	Factor
1. Prepare	1. Ease 2. Importance 3. J.O. point Knowledge Willingness 4. Correct Sample 5. Position
2. Present	6. Show 7. Tell 8. Slowly 9. Key points 10. Simple language
3. Apply	11. Learner performs 12. Errors 13. Practice 14. Sell back 15. Credit and praise
4. Test	16. On own 17. Available 18. Errors corrected 19. Taper off supervision 20. Schedule

How to do it: Get from "How to Instruct"

Cumulative time, 60 minutes

begins on page 248

Cold shower keeps cutting tools in trim

ANOTHER EXAMPLE OF PRODUCTION IMPROVEMENT THROUGH REFRIGERATION

A shower of oil is generally used to keep machine tools from overheating when they bite into metal. But often heat from high-speed cutting operations becomes too great to be absorbed by the oil. When this happens tools "burn" or become blunted.

To prevent this many shops today are using *refrigerated* cutting oils.

Tools showered with refrigerated oil cut with greater precision at faster speeds. They need fewer redressings, remain keen and sharp up to 20% longer with a corresponding reduction in machine down time.

Industry has found hundreds of ways to use refrigeration—to improve products, speed production, cut costs. Why not discuss the subject with your engineers?

And when you're ready to select industrial refrigeration or air conditioning, ask about equipment designed to use "Freon" refrigerants. For safety, efficiency and economy, "Freon" refrigerants are the logical choice for any type of installation. E. I. du Pont de Nemours & Co. (Inc.), "Kinetic" Chemicals Div., Wilmington 98, Delaware.

DU PONT
REG. U. S. PAT. OFF.
Better Things for Better Living . . . through Chemistry

KINETIC
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FREON
SAFE REFRIGERANTS
"Freon" is Du Pont's registered trade-mark for its fluorinated hydrocarbon refrigerants

ARO DOES IT AGAIN!

with AIRCRAFT DRILLS

ANOTHER ARO FIRST

1 **NEW SAFETY-LOCK TRIGGER** prevents tool starting up during drill bit changing.

2 **COMPLETE INTERCHANGEABILITY** of all parts... easy conversion from one model to another.

3 **SLO-SPEED, HI-TORQUE MODELS** (7365, 7366, 7367) for drilling high-tensile-strength modern metal alloys, armor plate, stainless steel.

Ask your ARO distributor for details. Write for catalog.

The Aro Equipment Corporation, Bryan, Ohio

Aro Equipment of Canada, Ltd., Toronto.

ARO AIR TOOLS

Also... LUBRICATING EQUIPMENT... HYDRAULIC EQUIPMENT ...AIRCRAFT PRODUCTS... GREASE FITTINGS

MAGCOA LIGHTWEIGHT MAGNESIUM

RAMP-DOCKBOARDS

...are flexible for greater freight-loading efficiency

Ramp and Dockboard lock together with simple pin device
Hand holds in each corner for safe, easy handling
Special quarter round curbs prevent runoffs—offer maximum clearance for equipment
Beveled edges minimize jarring of load
Rounded curb ends allow greater turning radius

A combination of two sections—the ramp (with I-beam legs), and the Dockboard. Each lightweight magnesium unit can be handled safely and easily by one person. Dockboard is used as separate unit when height difference is less than fixed height of ramp. When greater height differences are encountered, the ramp and Dockboard combination is used.

Specially designed for applications where low-clearance loading equipment is used. Weighs only ¼ as much as steel ramps of equal size and strength. A modern answer to materials handling headaches in all industrial and commercial fields. Write for complete details today!

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Representatives in All Principal Cities

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$60. per day more material recovered per machine

the MIKRO hand of ECONOMY

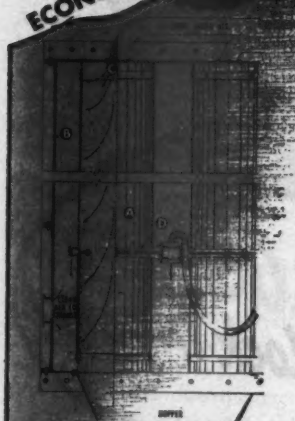


Diagram showing operation of the MIKRO-COLLECTOR

One large manufacturer processing a valuable material, recently found that each MIKRO-COLLECTOR* installed in his plant saved him an additional $60 per day in salvaged material.

Such savings are attributed to these advantages:

- ★ High percentage of recovery—99.9% plus.
- ★ Greatly reduced filter cloth area means low maintenance costs, quick and easy material changeovers.
- ★ Constant uniform flow of dust-laden air.
- ★ Filter rate from 15 to 25 cfm. per sq. ft. of fabric.
- ★ Cleaning ring eliminates mechanical shaking of bag.

The revolutionary principles employed in MIKRO-COLLECTOR design insure optimum recovery and sensational filter rates. Our research laboratory and test facilities are available for your dust collection problem without charge or obligation.

SEND FOR—your copy of new MIKRO-COLLECTOR bulletin.

PULVERIZING MACHINERY COMPANY
24 Chatham Road Summit, New Jersey

*Patents applied for by N. J. Hersey, Jr., and Pulverizing Machinery Company

MIKRO-COLLECTOR

By the makers of MIKRO-PULVERIZERS and MIKRO-ATOMIZERS

MANUAL . . . *begins on page 248*

SECOND SESSION

We are now going to have two members of our group give a demonstration of how job training is given. All of you will have a chance to participate in these role plays, as they are called, either as an instructor or as an operator. The assumptions we will go on are:

1. An ordinary operator, not a new girl, has made a mistake.
2. An employee needs retraining because a new method has been introduced.
3. An operator has the wrong attitude.

The supervisor will correct the operator by providing know-how or improving her attitude through reinstruction and investigation.

Elapsed time, 5 minutes

Now all of us will watch and take notes. At the end of the demonstration we shall try to see what was right and what was wrong with the demonstration.

The department head should prepare himself for the demonstration by doing the following:

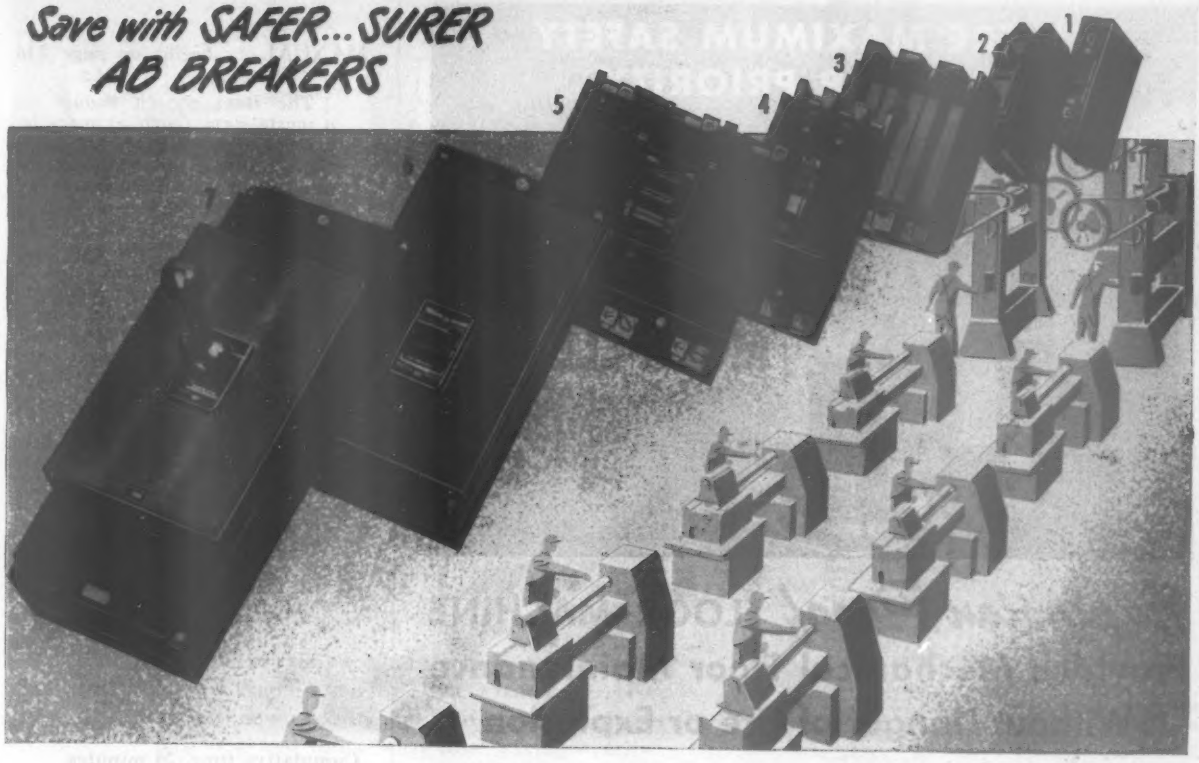
a. Utilize the "How to Instruct" employees' rating sheet. In addition to the information already on the sheet, the department head should place the name of the instructor and learner in the upper right-hand corner.

b. The department head should keep full and accurate notes on the sheet for later use during the discussion period. As points are covered in the later discussion, the department head will check them off the sheet. Points which are not covered by the group will be explained by the department head, or by leading questions by the department head.

c. The department head should guide the supervisors in their choice of subject on which to instruct. At the end of the first meeting the department head should either obtain volunteers or assign groups of two and the times each group is to perform. The department head will then discuss and guide them on the choice of subject. The proper choice may mean the difference between success and failure of the meeting.

More on next page

Save with SAFER... SURER AB BREAKERS



A FULL LINE OF PROTECTION for full production lines

Power outages are doubly punishing when production lines are loaded. Today, lost production means longer deliveries; idle men and machines add to already fast rising costs.

Westinghouse Circuit Breakers help you minimize down time, and offer you completely reliable control and protection for every lighting and power requirement and for circuits that serve them. Westinghouse Breakers trip instantly on short circuits, yet ride out temporary, harmless peaks. And to get you off to a flying start again when trouble on the circuit is cleared, simply flip the breaker handle. No replacements, no chasing after fuses, no costly maintenance time in restoring power.

For assistance on any circuit protection problem, contact your nearest Westinghouse representative, or write for bulletin No. DB29-060, Westinghouse Electric Corporation, Box 868, Pittsburgh 30, Pennsylvania. J-30047

THE AB CIRCUIT BREAKER LINE IS THE COMPLETE LINE—RANGE 5 TO 600 AMPERES

1. **P-1**—single pole; for applications where excessive vibration or shock is prevalent; 10-50 amperes.
2. **QUICKLAG®**—single pole; provides maximum protection for small-wire general lighting and branch circuits; 10-50 amperes.
3. **E FRAME**—1 to 3 pole; thermal trip type; for motors, lighting and other applications where time-delay is required; 5-70 amperes.
4. **F FRAME**—2 or 3 pole; thermal-magnetic trip type; 10-100 amperes.
5. **G FRAME**—2 or 3 pole; particularly adapted to severe operating conditions in heavy industry; 40-100 amperes.
6. **K FRAME**—2 or 3 pole; universal service power breaker; 70-225 amperes.
7. **L FRAME**—2 or 3 pole; primarily for main distribution feeders in central stations, industrial plants, commercial buildings; 125-600 amperes.

DESIGN TESTED AND VERIFIED IN THE Westinghouse HIGH POWER LABORATORY

YOU CAN BE SURE... IF IT'S Westinghouse

AB CIRCUIT BREAKERS

THE COMPLETE LINE

Explosion Proof FLOOR MACHINE

Provides Mechanical Floor Maintenance Without Danger of Fire or Explosion

The Multi-Clean Explosion Proof Floor Machine is designed for use on all types of floors in industries where the top requisite of good housekeeping is systematic and thorough cleaning to keep floors free of dangerous accumulations.

THE MULTI-CLEAN METHOD BRINGS LONGER LIFE TO ALL FLOORS

All floors—wood, concrete, quarry tile, terrazzo, asphalt, rubber composition or any other type will wear longer, look better and be safer when maintained by The Multi-Clean Method . . . the approved floor care method employing Multi-Clean tested floor liquids and equipment.

Floors in industrial areas where the danger of fire or explosion from airborne fumes or dust previously limited operations to slow and expensive hand labor now can be cleaned and maintained safely, efficiently and economically with the Multi-Clean Explosion Proof Floor Machine. Scrubbing, cleaning, buffing or polishing is accomplished quickly and safely, eliminating slip and fire hazards caused from grease, chemicals or other dangerous materials.

FREE! **FLOOR MAINTENANCE MANUALS**

To help you solve your floor maintenance problems. Handy reference file size, each manual deals with a specific floor and its proper care. Check those wanted in coupon below.

MULTI-CLEAN® PRODUCTS, INC.

MULTI-CLEAN PRODUCTS, INC.
2277 Ford Parkway, Dept. 34F
St. Paul 1, Minnesota

Gentlemen: Send more information on the Multi-Clean Explosion Proof Floor Machine and the maintenance manuals which I have checked.

☐ Linoleum ☐ Asphalt Tile
☐ Terrazzo ☐ Rubber Tile
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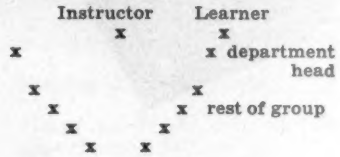
Name.....
Address.....
City.....Zone...State.....

Custom Cleaning Chemicals • Floor and Rug Machines • Permanent Floor Finishes • Industrial Vacuums

MANUAL . . . *begins on page 248*

The item chosen should be a waste item (such as material waste, machine care, etc.) and should be a problem known by and common to all members. Naturally no subject should be chosen that would be embarrassing to one of the group or one of the operators. Try to choose a problem which has been coped with successfully in the past. The item chosen should not be too complicated, and should be easy to demonstrate. Something like the filling in of a form is usually a bod one, since it is hard for the rest of the group to see. A manual task is better.

d. The department head should arrange the group so that all can see:



Cumulative time, 20 minutes

The department head should withhold all comments until the group has finished its comments. The discussion period should follow. The department head should make every attempt to stimulate critical discussion. If the conversation lags, the department head should ask questions, such as:

What was good about it?

How would you have done it?

What did you think of (a particular point on the rating sheet)?

What did you think she did best?

Why did she do it that way?

List on the backboard the relative comments — weakness and strengths of the demonstration, such as approach, clarity, and effectiveness:

Strong	Weak
1.	1.
2.	2.
Etc.	Etc.

Cumulative time, 35 minutes

After the group has commented on each demonstration, the department head should

More on next page

CASE NO. 1
MULTI-SPINDLE AUTOMATIC CHUCKING MACHINE
A cheap gear gave out — was replaced by a BOSTON Gear. Net difference in cost between a BOSTON Gear and a cheap gear ..... $ 0.80 "saved"
Cost of repairing machine (two men, 9 hrs.) @ $1.80 per hr. per man ..... 32.40 lost
Loss of profit through loss of 9 hours production — — 40 pieces per hour x $1.25 per piece x 9 ..... 450.00 lost
NET LOSS $481.60
(To say nothing of the re-scheduling headaches involved)
CASE NO. 2
GEAR DRIVEN OIL PUMP ON AN AUTOMATIC SCREW MACHINE
A cheap gear driving the pump failed and was replaced by a Standardized BOSTON Gear. Net difference in cost between a BOSTON Gear and a cheap gear ..... $ 0.35 "saved"
Cost of repairing machine (one man, 1½ hrs.) @ $1.80 per hour 2.70 lost
Loss of profit through loss of 3 hours production — — 50 pieces per hour x $0.95 per piece x 3 ..... 142.50 lost
NET LOSS $144.85

HOW *Cheap* IS A *Cheap* GEAR?

Sure, you can shop around and buy gears for a few cents less than STANDARDIZED *Boston Gears* — gears of known quality and proved performance.

But, stop and think what this "saving" really means. The purchase price of the gear is a tiny fraction of the cost of replacing a gear.

Look at these typical examples. They're not exaggerated. You can think of many like them.

Gears of inferior quality not only wear out faster, requiring more frequent replacement, but they're noisier, waste power, cause frequent bearing replacement...With gears it pays to standardize on the best — in design, material, workmanship, finish, accuracy — *BOSTON Gears.*

SPECIFY STANDARDIZED BOSTON GEARS

DESIGN THEM INTO YOUR EQUIPMENT

GET THEM FROM NEARBY STOCK

BOSTON Gear STOCKS ARE Here

at factory prices

Save time and money—assure yourself of uniform quality and parts interchangeability by standardizing on Boston Gear quality products—stocked at these Authorized Boston Gear Distributors — one near you!

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Bearing Distributors, Inc.
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Begor-Spuck Sup. Co.
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ALLENTOWN, PENNSYLVANIA
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250-256 Hamilton St.
ATLANTA, GEORGIA
J. M. Tull Metal & Sup. Co.
283 Marietta St.
BALTIMORE, MARYLAND
Carey Mchy. & Sup. Co.
3301 Brehm's Lane
BIRMINGHAM, ALABAMA
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Chandler & Farquhar, Inc.
900 Commonwealth Ave.
BRIDGEPORT, CONNECTICUT
Hawley Hardware Co.
1120 Main St.
BROOKLYN, NEW YORK
H. L. Dickie
314-36th St.
BUFFALO, NEW YORK
Root, Neal & Co.
64 Peabody St.
CHARLOTTE, NORTH CAROLINA
Matthews-Morse Sales Co.
909 S. Mint St.
CHICAGO, ILLINOIS
Boston Gear Works
955 W. Washington Blvd.
Chgo. Pulley & Shafting Co.
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Samuel Harris & Co.
114-116 N. Clinton St.
Power Trans. Equip. Co.
1245 W. Fulton St.
CINCINNATI, OHIO
Queen City Sup. Co.
Pearl & Elm Sts.
CLEVELAND, OHIO
Bearing Distributors, Inc.
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Boston Gear Works
211 St. Clair Ave., N. W.
Mac-Sherwood Sup. Co.
800 Lime Road
COLUMBUS, OHIO
Ohio Trans. Co.
666 Parsons Ave.
DALLAS, TEXAS
Geo. J. Fix Co.
2413-15 Commerce St.
DAYTON, OHIO
Klinger-Dills
1041 So. Patterson Blvd.
DENVER, COLORADO
Western Belting & Packing Co.
1720-28 Wazee St.
DES MOINES, IOWA
Standard Bearings Co.
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DETROIT, MICHIGAN
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BOSTON Gear STOCKS ARE Near

OUT OUR WAY
OH, BALONEY! YOU'RE LIVIN' IN THE OLD HORSE AN' BUGGY DAYS! A MOSSBACK OF THE OLD MUSTY MAUVE DECADE!
YEAH? WELL, IT'S THE OL' BOYS OF TH' MUSTY MAUVE THAT MADE IT POSSIBLE FER YOU TO HAVE WHUT LITTLE BRAINS YOU GOT! WHO INVENTED ALL TH' MODERN CONVENIENCES--SOME JITTERBUG LIKE YOU? HAH!
HE'S RIGHT--YOU HAD TO RIDE IN AN OXCART TO WANT SOMETHIN' BETTER ...THIS GENERATION IS GETTIN' TOO COMFORTABLE, I THINK!
THERE'S ONE IMPROVEMENT THEY AGREE ON, THOUGH--SOL-SPEEDI-DRI! TH' BOY IS SORE BECAUSE IT WAS OLD JOE WHO FIRST THOUGHT T'SEND FOR A SAMPLE!
J.R.WILLIAMS
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FREE SAMPLE: Fill out the coupon and mail today for big, free sample and brochure.

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FMM 3-51

MANUAL . . . *begins on page 248*

summarize the discussion to make sure that all points missed by the group are added. Refer back to the rating sheet, but also add an overall summary. The best way to do this is to list the meat of the discussion and demonstration—the boiled-down version of what you think should have been gained from the demonstration.

Demonstrations should continue as time permits. Probably two demonstrations per hour are a minimum.

Cumulative time, 55 minutes

A summary of what the whole group has gained from the meetings should be presented at the last meeting as follows:

1. **M.F. errors are 80% human failure.**
2. **Better on-the-job training will reduce human failures.**
3. **Supervisor has the opportunity and authority, therefore the responsibility.**

The above points should be re-explained by the department head as they are written on the board.

End the conference by thanking the group for their interest and cooperation. Congratulate them on their intelligent participation (let's assume you are able to do this sincerely). Explain that they will be invited to share in other mangement policies in the future. An example of a close is given below:

I want to express my appreciation for the excellent demonstrations. If there are any further questions now or later, don't hesitate to ask them. Remember that training is a continual process, and that the lessons developed here must be applied to be effective. We do not want to allow sharp tools to remain idle. From time to time it may be necessary to review these methods again.

I will distribute a copy to each of you of the job-instruction training sheets on how to instruct and a copy of a job-rating sheet. It would be wise to refer to these sheets often, especially when a retraining problem arises.

If all supervisors have not participated, schedule additional meetings until all have been either an instructor or learner.

Cumulative time, 60 minutes

"Like finding extra screws in every box!"

"At a time when a shortage of screws can very well set the limits of production, P-K* quality is more important to us than ever. Every screw is formed and hardened properly to drive right and hold right. There are no 'duds', and, believe me, that's like finding extra screws in every box!"

P-K will help in other ways to stretch your screw supply

P-K Assembly Engineers will help you in every way possible to adjust your assemblies to limited supplies. You may be able to use standard screws in place of hard-to-get "specials". By simplifying assemblies, you can sometimes use fewer screws without sacrifice of strength. Reducing multiple head styles, and using fewer diameters, with longer or shorter screws as needed, will also often help you to get improved deliveries.

Parker-Kalon, originators and leading producers of Self-tapping Screws, stand ready to apply their long experience to your most difficult problems of planning and procurement. Parker-Kalon Corporation, 200 Varick Street, New York 14, N. Y.

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P-K
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PARKER-KALON* SELF-TAPPING SCREWS
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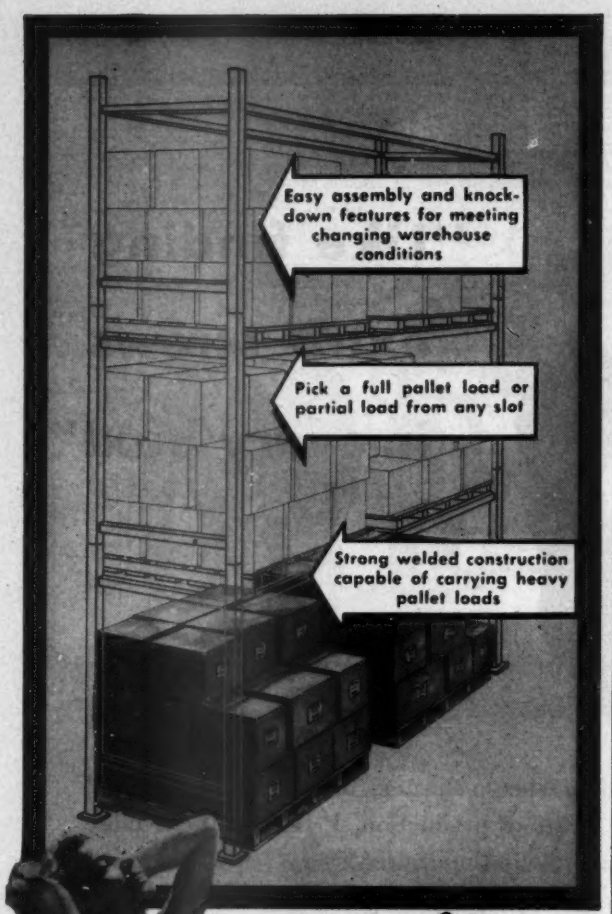

Easy assembly and knock-down features for meeting changing warehouse conditions
Pick a full pallet load or partial load from any slot
Strong welded construction capable of carrying heavy pallet loads

Well Stacked!

Prefabricated pallet racks by E.M.I. permit stacking to conserve floor space without tying up low level material. They are engineered for strength and safety and there's a type to suit your particular needs.

Write for our catalog. It illustrates all types.

EQUIPMENT MFG. INC.

21561 HOOVER, DETROIT 5, MICH.

THIS SQUIRT LOOSENS-

FROZEN BOLTS.. BEARINGS

It's fast and accurate—shoots 15 feet — a drop or a squirt. It's labeled Kroil — so you can grab it quickly when a frozen bolt, screw or bearing starts to cost expensive time or threaten production.

That is when Kroil creeps into millionth inch spaces to soften rust, dissolve gum and supply lubrication to loosen the parts. It's fast and it's positive.

> "Kano Kroil always opens up the tight fitting covers on fire extinguishers for us. It is truly a wonderful preparation. We have found such covers we could not force off with a blow of a hammer. Several minutes' seepage of Kroil did the trick," so says a service organization for fire extinguishers.

Kroilers are priced at $1.50 each and are well worth it. As an inducement to try Kroil we offer the combination of one Kroiler and one gallon of Kroil—(listed at $3.50) for $4.75. f.o.b. factory.

If you are not one of the 8,500 industrial plants already using Kroil, send for a gallon on the proposition that it will loosen the most stubborn frozen part or you get your money back.

KANO LABORATORIES 1067 THOMPSON LANE NASHVILLE 11, TENN.

DETECTO SCALES

There's a precision-accurate Detecto Scale for your specific weighing and counting need. The Detecto helps increase production, yet assures you maximum accuracy by making slightest weight discrepancies immediately visible.

DETECTO POST-O-METER

Another Detecto Scale that protects your profits. With the Detecto Post-O-Meter, you just press a key and get one precise to-the-penny magnified figure. Thermolastic spring compensates for temperature changes.

Write for Literature

DETECTO • SCALES • INC.

MAKERS OF FINE SCALES SINCE 1900

543F PARK AVENUE • BROOKLYN 5, N. Y.

SCALE ENGINEERS IN ALL PRINCIPAL CITIES

"All motors are NOT alike!"

Check these 15 Reasons Why the RELIANCE Bearing Design is *the BEST one!*

ONLY ONE MOTOR HAS ALL THESE DESIGN FEATURES:	DESIGN A Prelubricated cartridge—bearing mounted in bracket	DESIGN B Open bearing mounted in bracket	RELIANCE Double-shielded, prelubricated bearing mounted in bearing cap
Bearing sealed from dirt and other foreign material	YES	NO	YES
Enclosed bearing housing	NO	YES	YES
Bearing can be relubricated without being disassembled	NO	YES	YES
Motor can be regreased without removing drain plug	**	NO	YES
Automatic grease relief to suit any lubrication system	NO	NO	YES
Protection against grease entering windings	YES	*YES	YES
Balls free of direct pressure during lubrication	YES	NO	YES
Bearing can be removed without danger of distortion	NO	NO	YES
Reservoir to protect against undergreasing	NO	YES	YES
Standard commercial ball bearings	YES	YES	YES
Larger grease reserve than provided with any standard bearing	NO	YES	YES
Grease supply free of churning action	NO	NO	YES
Measuring unnecessary to prevent overgreasing	NO	*YES	YES
Unnecessary to grease equally at each side of ball race	NO	YES	YES
Lubricant is retained in ball race	YES	NO	YES

** Means is not provided for relubrication of assembled motor.
*YES, if drain plug is removed.

The Reliance Pre-lubricated Bearing Design has all of the features vital to maximum motor life. Check these points in the chart at left. The performance of Reliance PRECISION-BUILT Motors in all industries and under all operating conditions has proved their value in long-wearing, trouble-free bearing design.

In most applications, Reliance PRECISION-BUILT Motors operate satisfactorily for years without relubrication. Where it is a practice to grease regularly or where operating conditions make it desirable . . . it is impossible to overgrease a Reliance Motor. Write for *new* Bulletin B-2201 for the "inside story" of the Reliance Pre-lubricated Bearing Design.

Reliance PRECISION-BUILT A-c. Motors from ¾ to 300 Hp.

RELIANCE ELECTRIC AND ENGINEERING CO.

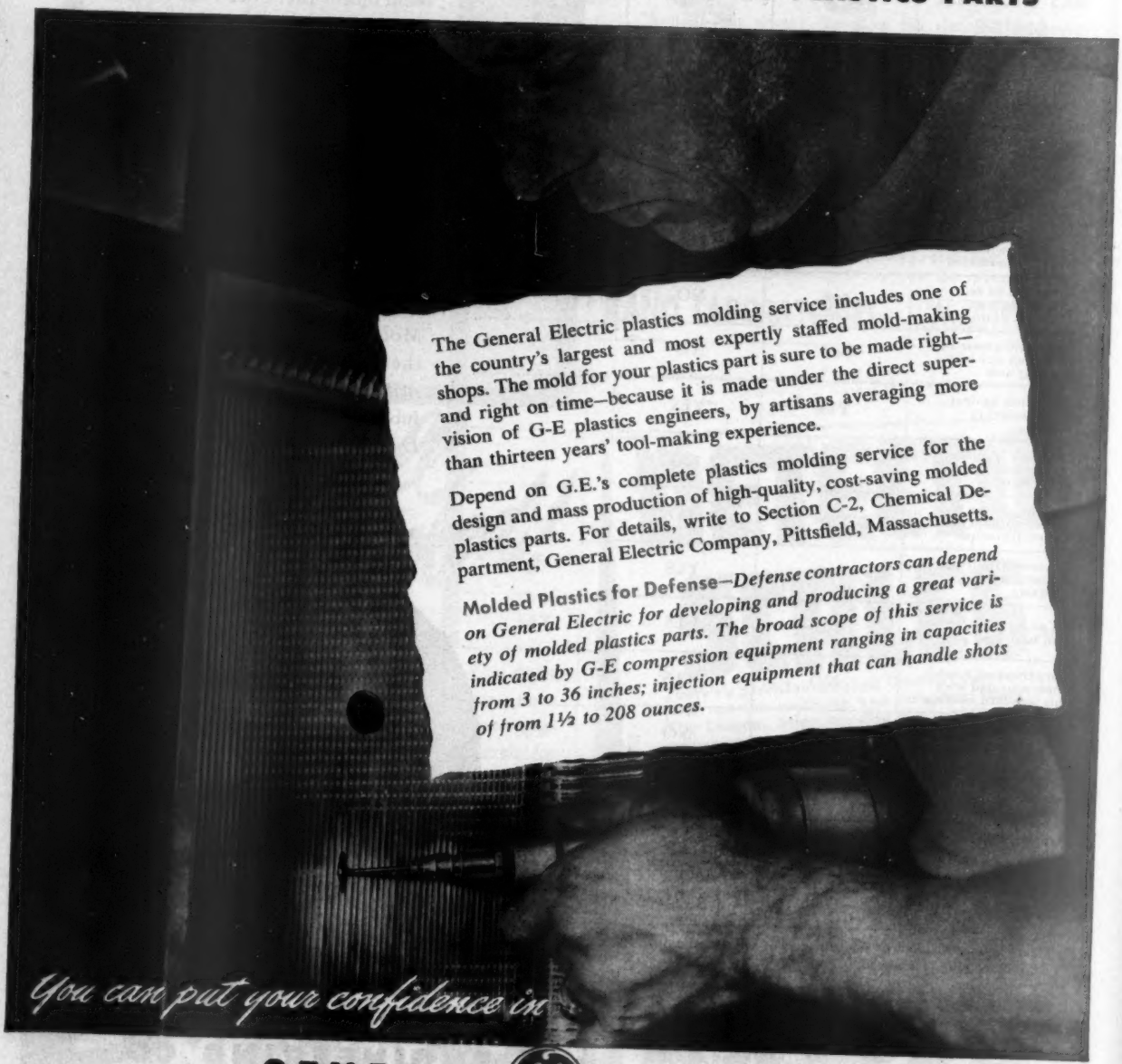
"All Motors are NOT Alike" • 1070 Ivanhoe Road, Cleveland 10, Ohio

HOW

One of a series of messages to plant managers and purchasing agents to show how General Electric's *specialized* plastics molding service is geared to highly efficient defense and industrial production.

Specialized MOLDING SERVICE

IMPROVES QUALITY, SPEEDS DELIVERY OF PLASTICS PARTS



The General Electric plastics molding service includes one of the country's largest and most expertly staffed mold-making shops. The mold for your plastics part is sure to be made right—and right on time—because it is made under the direct supervision of G-E plastics engineers, by artisans averaging more than thirteen years' tool-making experience.

Depend on G.E.'s complete plastics molding service for the design and mass production of high-quality, cost-saving molded plastics parts. For details, write to Section C-2, Chemical Department, General Electric Company, Pittsfield, Massachusetts.

Molded Plastics for Defense—*Defense contractors can depend on General Electric for developing and producing a great variety of molded plastics parts. The broad scope of this service is indicated by G-E compression equipment ranging in capacities from 3 to 36 inches; injection equipment that can handle shots of from 1½ to 208 ounces.*

You can put your confidence in

GENERAL ELECTRIC

This Firefighter can be two places at once!

You can protect several danger spots at one time with a Kidde built-in carbon dioxide fire extinguishing system. ¶ Widely separated fire hazards... even on different floors can be protected by a single Kidde system. If fire strikes a protected space, directional valves rush fire-smothering carbon dioxide gas to the stricken area. The same CO_2 can set off mechanisms to shut doors and windows... turn off fans and machinery. After doing its job, the clean, dry CO_2 evaporates completely. ¶ Whatever your fire detection and protection problem may be, a Kidde expert will be glad to help. When you think of CO_2 call Kidde.

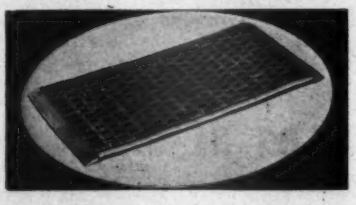
Walter Kidde & Company, Inc., 332 Main St., Belleville 9, N. J.
In Canada: Walter Kidde & Company of Canada, Ltd., Montreal, P. Q.

Kidde

INSTALL

TUF-TRED MATTING

FOR SAFETY—
QUIET—COMFORT



Also ideal for retarding fatigue and reducing breakage.

A highly popular, low priced, superior grade link rubber fabric matting and the only one equipped with non-trip beveled safety nosing on the ends. The links are strongly laced on galvanized rust-resisting steel wire, reinforced by metal plates. Thickness 5/8". Width: up to 6 feet. Any length.

Consult your telephone directory for American Mat office or USE COUPON NOW FOR OBTAINING LITERATURE AND PRICES.

AMERICAN MAT CORPORATION

"America's Largest Matting Specialists"

1745 Adams Street, Toledo 2, Ohio

☐ Please send literature and prices on Tuf-Tred Matting.

Please send literature on ☐ Traffic-Tred Corrugated-Perforated Matting; ☐ Counter-Tred Safety Matting; ☐ Ameriflex Wood Link Matting; ☐ Do-All Rubber & Cord Matting.

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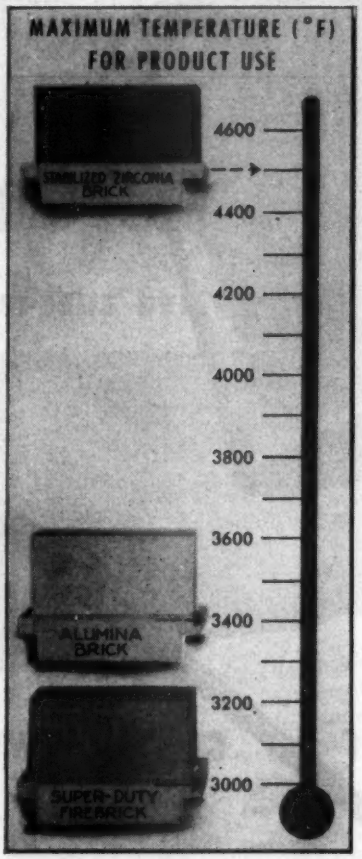
INQUIRIES INVITED FROM DISTRIBUTORS AND DIRECT FACTORY REPRESENTATIVES

NEW MATERIALS



Stabilized Zirconia Withstands 4500° F.

Fused stabilized zirconia is a new refractory which has given a real boost to the temperature ceilings on production processes. It promises to open up broad and important high-temperature operations. The temperature it can withstand —4500 degrees F. That's one and a half times the top temperature of a steel melting furnace. It was developed by the Norton Company, Worcester 6, Mass., and arrives at a time when there are already many production processes which operate at temperatures ordinary refractories can hardly withstand.

What It Is. Chemically, the new refractory is about 88% zirconium oxide. Additions make it expand linearly with temperature increases. It's made from zircon sand, found in Australia and Florida. Zirconia is being produced now in all standard brick shapes, as well as in the form of tubes, plates, discs, and a wide variety of special shapes.

What It Will Do. The chart (left) shows just how much higher its melting point is than other good refractories. And it's one of the best heat insulators known, with three times the insulation quality of alumina. Norton has a small lab furnace operating above 4000 degrees F. It's insulated with just three inches of zirconia. You can touch the outside of the furnace with your bare hand. This low heat loss points to real savings in fuel costs, and makes it much easier to attain top temperatures.

It can withstand sudden changes in temperature without cracking or breaking down. That's what "stabilized" means. If zirconia is not stabilized by adding lime, it changes from one crystalline form to another, and the accompanying volume change breaks down the refractory.

And at temperatures exceeding 2700 degrees F., it has high electrical conductivity. Using it as an electric heating element makes possible high frequency induction furnaces and resistance furnaces operating as high as 4000 degrees.

How It Can Be Used. It's already in use as a lining in many high temperature furnaces—gas synthesis and metal melting furnaces, and ceramic kilns—all operating above 3000 degrees. Kiln furniture is at present its most important commercial application. And it's in use as insulation in many top temperature operations.

Zirconia won't replace present refractories in many applications. For one thing, it's expensive. A brick, 9½"x4½"x2½", costs $9.43. Alumina brick sells for $2.10; superduty fire brick for as little as 25¢ a brick. But where there's loss of production due to breakdown of refractories pushed to peak temperatures, zirconia will step in.

Company officials feel that the most important uses of stabilized zirconia are as yet undeveloped. Up to now, engineers have had to plan processes with the melting point of ordinary refractories as a top operating temperature.

More on next page

DURA-CUT ABRASIVE DISCS

(used on right angle portable grinders and disc sanders)

These new flexible discs are 1/8" thick while the ordinary coated discs have but a single layer of abrasive. Contrasting such a tremendous amount of additional cutting ability it is easy to understand DuraCut's startling advantages.

- **Greater economy.**
- **Longer life — 15 to 20 times.**
- **Faster, sustained rate of cut.**
- **Increased labor savings — less disc changing.**
- **Safe — strong — resist tearing.**
- **Available in a wide range of grits, grades and structures — permit control over rate of cut and finish.**
- **Available in raised hub or flat shapes.**

Ask for a demonstration.

Typical applications . . . Blending and finishing of steel, stainless, alloy steel and aluminum welds . . . Removing rust and scale . . . Finishing sheet metal jobs . . . Auto body work . . . Cleaning weld spatters.

BAY STATE®

BAY STATE ABRASIVE PRODUCTS CO., Westboro, Mass.

Chicago, Cleveland, Detroit, Pittsburgh • Distributors, All Principal Cities.

Even the "health department" approves these

CLEAN, SMOOTH CASTINGS!

Absolute cleanliness is a special requirement for electric motors used in dairies and food-processing plants. Inside and out, these motors must be smooth and clean, completely free from nicks or blemishes that might serve to hold dust or dirt. Every motor is subject to frequent, rigid inspections by various health and sanitation authorities.

In The Master Electric Company foundry, Buckeye air grinders are used in the preliminary stages of production on Master Sanitary motors. On bearing housing castings, for example, a Buckeye pencil grinder, equipped with a special extension collet, gets into every curve and crevice of these castings, assures a perfectly smooth, clean job.

Cleaning the tops, bottoms and the numerous fins on castings for Master Fancooled motors is another Buckeye air tool job in this foundry. Despite the limited space between the fins on these castings, flexible, easy-to-handle Buckeye vertical sanders have cut the time required for this difficult cleaning operation.

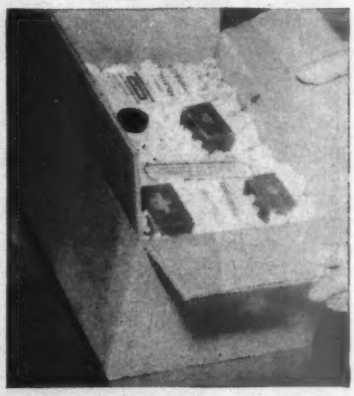
Buckeye grinders and sanders do the difficult jobs in less time, at lower cost. We'd like to prove that . . . in your plant . . . on your job. A Buckeye Tools Field Representative will gladly arrange a test, without obligation.

Buckeye Tools CORPORATION
DIVISION 13 • DAYTON 1, OHIO

Portable Air and Electric Tools for Industry

NEW MATERIALS

Begins on page 266



POPCORN PACKING may be in the next carton you open. Winthrop-Stearns, Inc., 33 Riverside Ave., Rensselaer, N. Y. is using the good old-fashioned variety to cushion shipments of fragile objects. They claim it gives better protection, weighs less, and is easier to handle than conventional packing. To foil mice and men, they use it unsalted and unbuttered. Patent is pending; available now for license. The Post Office has already given popcorn packing the green light.

TROPICAL PLANT EXTRACTS in Agava Clear-A-Drain make it a safe but efficient drain cleaner. It cleans by mechanical osmotic action, not by boiling as caustic compounds do. Agava Products, Inc., 34 Exchange Place, Jersey City, N. J.

YOU CAN USE FO 128 solvent as a substitute for carbon tetrachloride in cleaning mechanical or electrical equipment. It's completely safe for both men and materials. FO 128 has low toxicity, high flash point, and leaves no residue on drying. Fine Organics, Inc., Aviation-Industrial Chemicals Div., 211 E. 19th St., New York 3.

A DUCK'S BACK will have nothing on porous masonry walls when it comes to shedding water—if you use Siliphane. When sprayed or brushed on masonry, it penetrates pores and cracks with a microscopic water-repellent film. Prima Products, Inc., 10 E. 40th St., New York, claims its Siliphane does not seal pores to prevent breathing. The transparent liquid will not change surface appearance of the masonry.

More on next page

NEW TRUCK MOUNTED CONTACTORS

Cut Inspection Time!

Now, for the first time, air contactors have been truck mounted! The contactors of this Synchronous Motor Controller are mounted on wheels—easy to remove through front or rear hinged doors. Just disconnect the power leads, unplug the control circuits and withdraw the contactors for easy inspection.

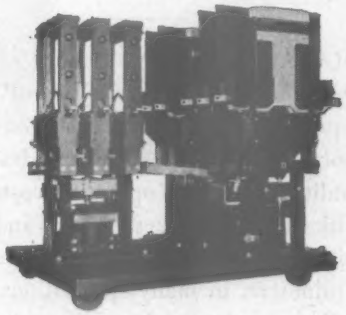
You save space! The starter is smaller because room for inspection isn't needed within the cubicle. Truck mounting is a feature of Type *H* Starters using three air contactors.

For *complete* control plus protection of squirrel-cage, synchronous and wound rotor motors up to 1500 hp at 5000 volts . . . all in one attractive steel cabinet that is compact and easy to install . . . specify Allis-Chalmers Type *H* Starters.

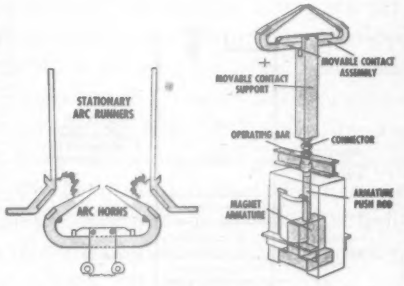
For full or reduced voltage starting, a single starter or an entire control group, check with your nearby A-C representative or send for bulletins 14B6410 and 14B7303.

A-3107

ALLIS-CHALMERS, 1078A SO. 70 ST. MILWAUKEE, WIS.



THREE TYPE 256 AIR-BREAK CONTACTORS are mounted on a common base of heavy gauge metal . . . mechanically interlocked to provide reversing and dynamic braking for a synchronous motor. Base is on wheels — rolls into cubicle on guide rails. This truck mounting provides for quick, easy, unhindered inspection.



DOUBLE BREAK CONTACTS AND STRAIGHT LINE VERTICAL ACTION are combined in Allis-Chalmers Air-Break Contactors to eliminate maintenance factors like flexible contact leads, turning shafts and shaft bearings. These contactors are clean, easy to inspect and maintain . . . accessible in compact, attractive Type *H* Starters.

A-C ALLIS-CHALMERS

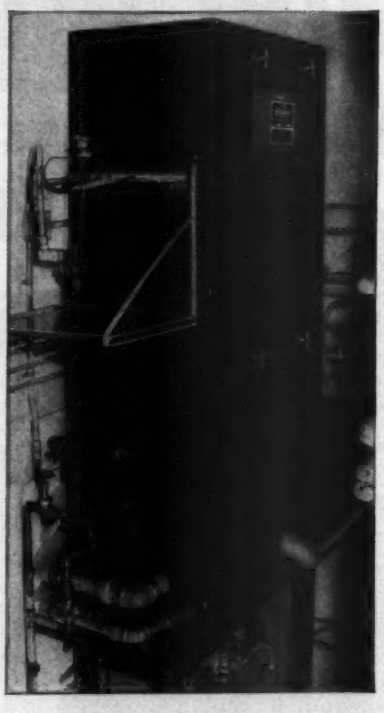
ALLIS-CHALMERS

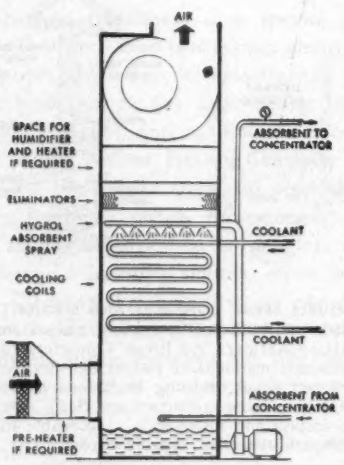
New "Controlled Humidity" Method Gives a Better Solution to Air Conditioning Problems

"Hygrol" Absorbent Liquid Dehumidifies Fresh Air Without Refrigeration

NIAGARA Air Conditioners or Dehumidifiers using "Hygrol" liquid absorbent give precise control of air temperature and humidity... at lower operating cost, with large savings in space and with smaller and less expensive equipment, in many applications.

This method dehumidifies the air by passing it through a chamber in which "Hygrol" spray removes its moisture and produces a low dew point. The "Hygrol" solution resulting is continuously and automatically re-concentrated, providing always full capacity in air conditioning and assuring always a constant dehumidifying capacity and a trustworthy, constant condition for your material, apparatus, process or room to be conditioned.





NIAGARA CONTROLLED HUMIDITY METHOD — FLOW DIAGRAM

Write for Bulletin 112

"Hygrol" is a liquid, not a salt solution; it stays pure and non-corrosive; it does not cause maintenance or operating troubles in food plants or in chemical processes.

Investigate this new Niagara Method for "comfort" air conditioning as well as to protect quality in hygroscopic material, or processes or instruments, or to prevent condensation damage to metals, parts or products.

NIAGARA BLOWER COMPANY

Over 35 Years Service in Industrial Air Engineering

Dept. F, 405 Lexington Ave. New York 17, N. Y.

Experienced District Engineers in all Principal Cities

NEW MATERIALS

Begins on page 266

ARE YOU LOOKING FOR sources of benzene or chloride? If critical shortages are cutting into your supply, get in touch with the Pennsylvania Salt Mfg. Co., 49 Lea St., Whitemarsh, Philadelphia. They have large quantities of Alpha Beta crystal (27% benzene and 73% chloride) that can be broken down into component parts.

WASTE CEDAR SHAVINGS, of all things, are being put to use in a new boiler compound. You add Borgana to feed water to prevent rust and scale formation in boilers and steam lines. The Portland Shingle Co., 9036 N. Denver Ave., Portland 17, Ore., makers of Borgana, point out that their compound uses no war-short chemicals.

CLEAN YOUR ENGINES with D-Carb. Solvent, made by The DuBois Co., Dept. J, Cincinnati 3, Ohio, removes carbon and sludge deposits from all parts of internal combustion engines. D-Carb can be used safely on aluminum, magnesium, copper, brass, and other metals. Water seal cuts down on vapors and makes it safer for workers, too.

NEOPRENE COATING for maintenance applications can be brushed or sprayed on steel, wood, or cement surfaces. You get a protective layer that stands up under temperature and abrasion, and is fume, oil-, and acid-resistant. Layers can be built up one on top of the other—you never need to remove the old coating. Gates Engineering Co., P.O. Box 1711, Wilmington, Del.

EXPERIMENTAL QUANTITIES of the first three of a series of organic sulfonyl fluorides are now available from Research and Development Div., Pennsylvania Salt Mfg. Co., 1000 Widener Bldg., Philadelphia 7. Pennsalt recommends them for evaluation as solvents, heat transfer agents, as intermediates in the manufacture of dyestuffs, and as chlorination media. Pennsalt has technical data on these and other possible applications.

TOTRUST stops rust. This rust-inhibiting primer dries fast. You can recoat in from 10 to 30 minutes. The Wilbur & Williams Co., Boston 35, Mass.

WHAT YOU SHOULD KNOW ABOUT DU PONT

ORLON

REG. U. S. PAT. OFF.

acrylic fiber

Many years' search for a fiber with a specific combination of properties to satisfy specific needs of the textile industry is behind the development of "ORLON" acrylic fiber, latest addition to the Du Pont fiber family. Now that "ORLON" continuous filament is in commercial production, you will be interested in learning what these properties are . . . and the applications for "ORLON" they suggest.

OUTDOOR RESISTANCE—"ORLON" is in a class by itself when it comes to resisting damage from some of the worst enemies of textile fibers—sunlight, soot and acid fumes. "ORLON" also has excellent resistance to damage from moisture, insects, mildew, molds and other microorganisms.

CHEMICAL AND HEAT RESISTANCE—Immersion tests prove the outstanding resistance of "ORLON" to deterioration by mineral acids and a broad range of other chemicals. Fabrics of "ORLON" are being used in industrial filtration processes at high temperatures.

BULK WITH LIGHT WEIGHT—A cross-section of an "ORLON" fiber is not round, but "dog-bone" shaped. This, plus a low specific gravity means that fabrics made of "ORLON" can have high bulk and covering power—with light weight.

STRENGTH—The tenacity of "ORLON" is in a range with other high-strength fibers. What's more, "ORLON" has the right *balance* of physical properties—strength, low moisture sensitivity, high stretch resistance—for easy processing.

EASY TO CARE FOR...PLEASING TO TOUCH—Properly made fabrics of "ORLON" are easy to wash, don't need stretching, dry quickly without losing their original shape, require little or no pressing. "ORLON" has a luxurious luster . . . is warm and friendly next to the skin.

Although no fiber serves every textile need, these and other properties of "ORLON" promise new fields of use for man-made fibers and improvements in a variety of existing textile products. Already, fabrics of "ORLON" are setting new performance standards in awnings, outdoor furniture, curtains, auto tops, industrial filters, electrical insulation, acid-resistant work clothes. Experimentally, "ORLON" has shown great promise as an apparel fiber—in suits, socks, shirts, dresses, lingerie, sweaters. Some of these apparel items will soon begin to appear in small but increasing quantities. From now on, the future of "ORLON" depends a great deal on the technical skill of mills, converters and manufacturers in processing and fabricating "ORLON" into finished products.

"ORLON" (a Du Pont trade-mark, not a generic term) is now available to industry as a continuous filament fiber. "ORLON" staple will not be in quantity production for some months. Perhaps you would like to start thinking of ways this new fiber might help you make a better product . . . a new product . . . or improve your production process. If you'd like additional information on the use of "ORLON" acrylic fiber, write E. I. du Pont de Nemours & Co. (Inc.), Acetate Division, Wilmington 98, Delaware.

DU PONT

REG. U. S. PAT. OFF.

BETTER THINGS FOR BETTER LIVING . . . *THROUGH CHEMISTRY*

ONE SIGNAL or a COMPLETE SYSTEM!

It's the "NAME" THAT ASSURES DEPENDABILITY

SPERTI

STANLEY & PATTERSON

FARADAY

HOLTZER-CABOT

Whether your problem concerns a clock system, intercommunications, fire alarm or a plant paging or signal system, depend on Stanley & Patterson, Faraday, Holtzer-Cabot to give you the best there is. The Faraday UNI-PACT System is particularly important to plants with varying noise levels. 17 quick-change signal units—bells, horns, buzzers, chimes—fit one adapter plate — give you a tailor-made system at all times regardless of noise conditions. Next signal job, consult the nearest Sperti Faraday Branch Office or Representative. They can be helpful in planning the work economically.

It's SPERTI for ULTRA-VIOLET SANITIZERS

Keeping office and factory workers healthy on the job is particularly difficult in winter months. Sperti Ultra-Violet Sanitizers are world famous for purifying polluted air in stuffy rooms, killing bacteria and reducing the possibility of group infection and the spread of colds and flu. Available in many types of fixtures, some combined with incandescent light. Write for Sperti Ultra-violet catalog.

GO "FIRST CLASS"

Sperti Faraday Inc.

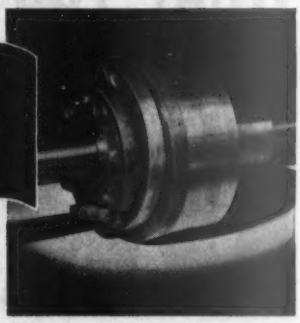
ADRIAN, MICHIGAN

BELLS • BUZZERS • HORNS • CHIMES • ULTRA-VIOLET SANITIZERS
VISUAL AND AUDIBLE PAGING DEVICES AND SYSTEMS

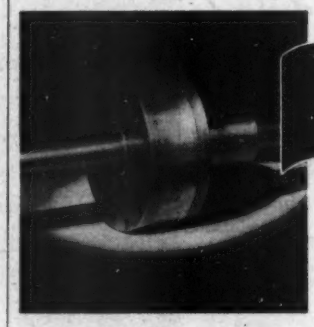
HILLIARD Clutches

FOR POWER CONTROL DESIGNS

HILLIARD SINGLE REVOLUTION CLUTCH



Unequalled for accurate control of intermittent machine operations — cutting, punching, and packaging. Gives closer tolerances to cut-off, stamping, shearing, and similar machines. Completely automatic; manual, mechanical, or electrical control.



HILLIARD OVER-RUNNING CLUTCH

Hilliard Over-Running Clutches and Couplings are automatic in operation. They are unexcelled for automatic two-speed drives, dual drives, stand-by drives, and for allowing machinery to "coast" after drive stops. Excellent as fixed or infinitely adjustable ratchets.

HILLIARD SLIP CLUTCH

A reliable series of spring-loaded slip clutches and couplings. Rugged construction with ample friction surface for heavy-duty use. Outstanding for preventing overloads and shocks; for starting heavy loads; as tension drag brakes; for reeling and winding operations; and many other uses.

★ **Hilliard Clutches and Couplings make machine drive and power transmission more efficient and economical. Experienced engineers will be glad to offer their advice on any problem. Complete descriptive material wil be furnished on request.**

WRITE TODAY for our illustrated brochure #MP-4 for information.

CLUTCH MAKERS FOR OVER FORTY-FIVE YEARS

The HILLIARD Corporation

152 W. Fourth St., Elmira, N. Y.

OFFICES IN PRINCIPAL CITIES

HOW TO GET MATERIALS HANDLING EQUIPMENT IN A HURRY

Stepped up plant modernization plus the production necessitated by the defense effort have put an extraordinary drain on modern materials handling equipment. The demand for Powell equipment has far exceeded our steel allotments.

If you need pallets, boxes or platforms in a hurry and can supply the steel or issue a D. O. or Government Contract number, contact your nearest Powell representative or write direct, and the vast facilities and extensive experience of Powell will go to work for you immediately.

See Us At
BOOTH 507
National Materials Handling Exposition

OUR MODERN FACILITIES AND "KNOW HOW" ARE UNSURPASSED IN THE INDUSTRY.

POWELL PRESSED STEEL CO., HUBBARD, OHIO
ORIGINATORS OF COLD FORMED ALL STEEL HANDLING EQUIPMENT
(In Greater Youngstown)

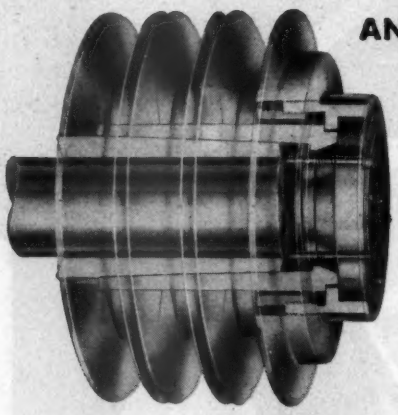
POWELL
PRESSED STEEL
SINCE 1920

Only AMERICAN WEDGBELT® SHEAVES give you the advantages of TAPER-BUSHED HUBS

ON BOTH

Multiple-Groove Fixed-Pitch Sheaves

AND



Multiple-Groove Adjustable-Diameter Sheaves

Only American Wedgbelt Sheaves give you the advantages of *quicker assembly, easier breakaway* yet *maximum clamping action* in *both* fixed-pitch *and* adjustable-diameter multiple-groove sheaves.

Assembly is quicker because of one-piece, accurately-machined bushings—breakaway is easier because of the exclusive "perfected taper" of American Wedgbelt bushings—maximum clamping action is assured because the bushings are *split all the way* through. In addition, precision manufacturing assures accurate, long-wearing grooves and balanced vibration-free operation.

Look to American as your source of supply for *all* V-belt drive products: Taper-bushed Standard Wedgbelt Sheaves, Double-Taper Adjustable-Diameter Wedgbelt Sheaves, F.H.P. Sheaves and F.H.P. and Multiple Wedgbelts. Mail the coupon below for full information on the complete line of American Wedgbelt Drives.

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Please send me information on American Wedgbelt Drives.

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DIRECTORY OF MOBILIZATION AGENCIES

To help you decipher the barrage of initials now coming out of Washington, here's a continuation of the list started last month in FACTORY (see page 238). We're listing just the more important agencies, together with a brief description of the function of each. Keep 'em. There'll be more coming later.

MISCELLANEOUS MOBILIZATION AGENCIES

ASRB—Armed Services Renegotiation Board. The three operating divisions—Army, Navy, Air Force—constitute the renegotiation appeals boards.

ASSPO—Armed Services Supply and Procurement Officer. General designation of officers in charge of military production contracts. (*Pronounced as a word, ass-po, not A.S.S.P.O.*)

Buair — Bureau of Aeronautics, U. S. Navy (*Rhymes with "few wear"*)

Buord — Bureau of Ordnance, U. S. Navy.

Buships—Bureau of Ships, U. S. Navy.

CE—Corps of Engineers, U. S. Army.

CSRB—Contract Settlement Review Board. Handles early termination of military production contracts.

GAO—General Accounting Office. Audits government expenses.

MRPARB — Military Renegotiation Policy and Review Board. Sets and reviews renegotiation policies only; not an operating agency.

QMC—Quartermaster Corps, U.S. Army or **U. S. Air Force.**

MISCELLANEOUS FEDERAL AGENCIES

BC — Bureau of the Census. Makes statistical surveys for many of the mobilization agencies.

BES — Bureau of Employment Security (*of the Dept. of Labor*).

BLS—Bureau of Labor Statistics. Collects statistics on living costs and labor force.

CIA—Central Intelligence Agency. Coordinates intelligence activities of all Armed Services.

More on next page

Shooting for low-cost installation?

Secondary feeders for softball field lights—7,000 ft. of 300,000 cm aluminum cable, neolay insulated, buried direct. Voltage drop held to less than 2% on 220/110-volt circuits. (Runs up to 375 ft.)

figure it in aluminum

You can't miss seeing the saving when you figure wiring in aluminum. For distribution lines, power and feeder cable, for industrial wiring—insulated aluminum electrical conductors cost less to buy, less to install. The bigger the cable, the greater your saving. For names of manufacturers, call your nearby Alcoa sales office (look under "aluminum" in your classified telephone directory). ALUMINUM COMPANY OF AMERICA, 1771C Gulf Bldg., Pittsburgh 19, Pennsylvania.

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Although the rearmament program prevents unrestricted sale of aluminum, we are ready to help you with the planning required for electrical wiring projects. Get the facts! Write for "Questions & Answers About Aluminum Conductors and Installations".

Insulated Aluminum Conductors

ALCOA

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FASTER.. ..MORE EFFECTIVE FIRE CONTROL
WITH THE ANSUL Stream Pattern
..plus BETTER HEAT-SHIELD PROTECTION
Exclusive Features
• Water-tight construction.
• Provides a modified cone-shaped stream pattern without hole in the center of the stream.
• Each nozzle gas pressure tested after assembly.
• Special spring loaded packing to insure lasting water-tightness.
• Designed for use by inexperienced operators.
• Low velocity, more effective stream of dry chemical.
Why Advertise the Nozzle! . . . .
. . . . because the nozzle on your ANSUL Dry Chemical Fire Extinguisher is water-tight . . . it won't become inoperative due to corrosion or caking of dry chemical within the working parts . . . the most inexperienced man in your plant can use the ANSUL extinguisher effectively . . . and only Ansul has a nozzle to meet all of these requirements!
If your hazards require special long range straight stream nozzles, you can get Ansul Extinguishers equipped with these nozzles at no extra cost. With Ansul Dry Chemical Fire Extinguishing Equipment you have not only the best fire protection but also a choice of models and designs to meet your requirements.
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"PLUS-FIFTY" DRY CHEMICAL IS MORE DEPENDABLE ALL-WAYS!
THIS TRADE MARK ASSURES YOU OF QUALITY PRODUCTS

Begins on page 274

CDA—Civil Defense Administration. Coordinates civil defense activities. *(Successor to OCD)*

ECA—Economic Cooperation Administration. Runs Marshall Plan.

FBI—Federal Bureau of Investigation.

FCC — Federal Communications Commission.

FDA—Food and Drug Administration.

FMCS — Federal Mediation and Conciliation Service. Helps settle labor disputes under Taft-Hartley.

FPC — Federal Power Commission.

FTC — Federal Trade Commission. Investigates monopoly charges.

GPO—Government Printing Office. Source of all official government documents. Address: Superintendent of Documents, GPO, Washington 25, D. C.

ICAF—Industrial College of the Armed Forces. Trains members of Armed Forces and selected civilians for mobilization jobs.

ICC—Interstate Commerce Commission.

NLRB—National Labor Relations Board.

NMB — National Mediation Board. Helps settle disputes under Railway Labor Act.

NRSSP—National Roster of Scientific and Specialized Personnel. Master list of qualified persons, maintained by NSF.

NSF—National Science Foundation. Scientific advisory body to President; maintains NRSSP.

OCD — Office of Civil Defense. Superseded by CDA.

ORR—Office of Rubber Reserve. Functions and personnel transferred to rubber division of NPA.

REA—Rural Electrification Administration.

SEC — Securities and Exchange Commission.

SS (or SSS)—Selective Service (System). The draft.

SSA—Social Security Administration.

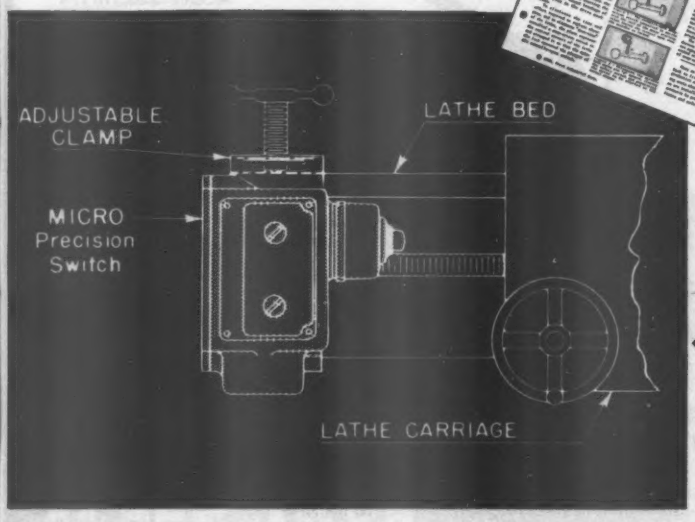
USES — United States Employment service; a division of BES.

USPH — United States Public Health Service.

VA—Veterans' Administration.

W-HD — Wage and Hour (and Public Contracts) Division *(of the Department of Labor).* Enforces wage and hour provisions of Fair Labor Standards and Walsh-Healy *(Public Contracts)* Acts.

"MICRO TIPS" is full of ideas like this



While there are many ways to install adjustable limits on lathes, shapers and similar machines, this sketch shows how one plant engineer did this by mounting a snap-action switch on an adjustable bracket.

Snap-action switches are used to prevent possible jamming on screw-jacks of large presses. The switch is installed to open the control circuit of the ram motor before it screws the jack to the last few threads.

A snap-action switch assures safe operation of a water-cooled compressor. It allows the compressor to run only if the cooling water is being discharged.

MICRO . . . first name in precision switches

With new machinery hard to get, plant engineers, electricians and maintenance men find MICRO TIPS a veritable gold mine of information on how snap-action switches revitalize present equipment.

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These are time-tested practical ideas sent to MICRO TIPS by plant engineers and maintenance men in every phase of industry. Get on the mailing list for MICRO TIPS today.

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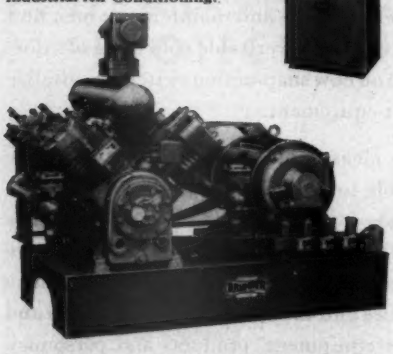
AIR CONDITIONING

In industry's constant search for ways and means to increase production, control quality and improve both plant and office workers efficiency, *air conditioning has frequently been found the answer* to some or all of these problems.

Brunner Air Conditioning units are available in capacities up to 75 hp for remote installations and in self contained room type units up to 10 hp...all backed by years of manufacturing and installation experience warranting your complete confidence in selection.

Brunner Model BAC 30-1. Self contained Room Air Conditioner.

Brunner Model E75,000. Eight cylinder compressor designed for heavy duty commercial and industrial Air Conditioning.



It will pay any management or production executive well to "talk" air conditioning with a Brunner representative. Following general discussion of your specific needs he can then...if you so desire...make definite recommendations.

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Designed Especially for Machine Tools, and Work on Assembly and Inspection Benches

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Localites are available through selected distributors everywhere.

LOCALITE fostoria for Light ON the Job

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ALLIGATOR V-BELT FASTENERS

● Alligator V-belt Fasteners and the open-end V-belting now being made by belting manufacturers, will enable you to make up multiple V-belt drives from roll belting. These fasteners have been on the market 9 years and are now being used on a wide variety of drives.

Available for B, C, D sizes of belt for industrial use and 1-in. and 2-in. sizes for railroad use. These fasteners, however, should not be used for repairing endless cord V-belts.

Bulletin V-205 will give you complete details as to where and how these fasteners are used, sizes, list prices, tools and application instructions. A copy will be mailed at your request.

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50% greater concrete strength
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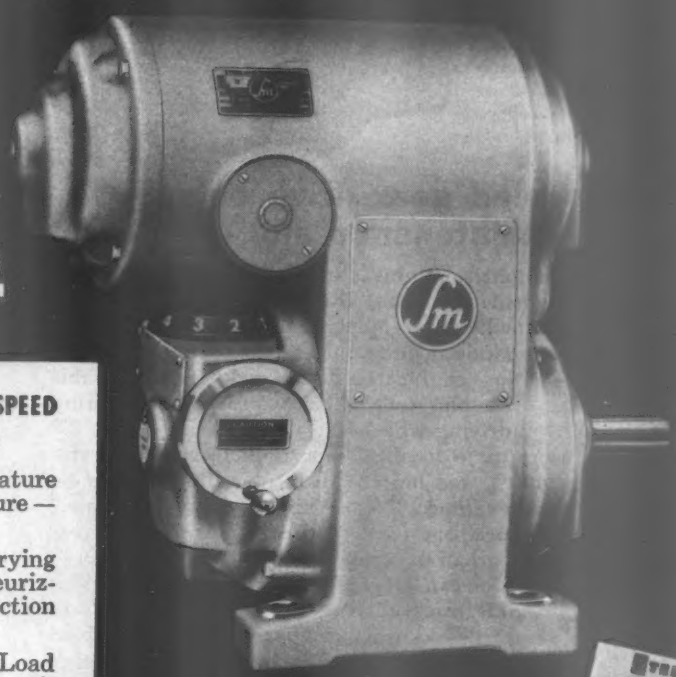

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Plants: New York 51, N. Y.; Los Angeles 22, California; Hamilton, Canada; Santiago, Chile.

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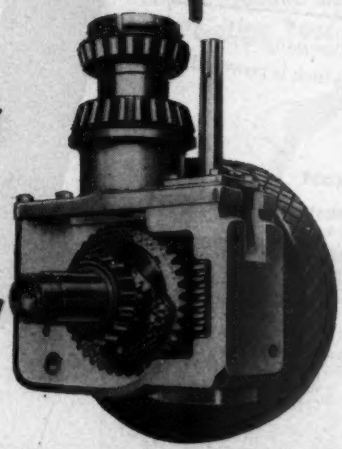
Here's why users get

"400% longer life"

from Stuebing Hydrolectrics



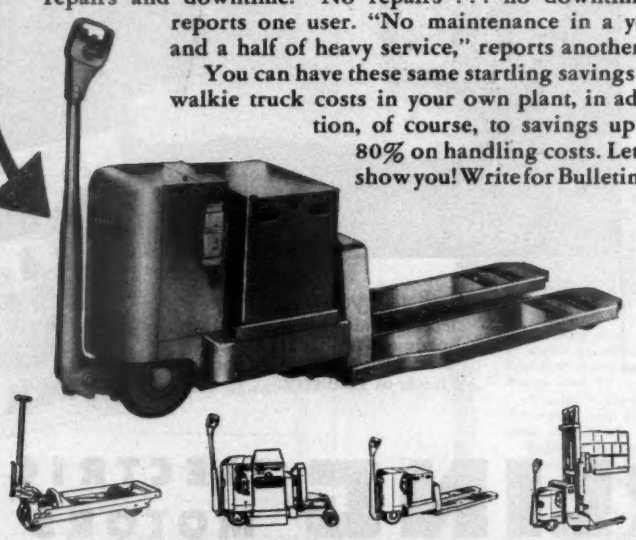
This sealed gear drive cuts 80% off maintenance and downtime!

Sealed in lubricant, this alloy-steel gear drive in the Stuebing Hydrolectric takes the place of old-style drive chains . . . actually gives Stuebing walkie trucks a drive comparable to modern automobiles.

Only Stuebing engineered Lift Trucks give you this sealed gear drive plus four-wheel stability, easy steering and twin front driving wheels.

From users came startling reports of increased service life up to "400% and more!" plus astounding savings on repairs and downtime. "No repairs . . . no downtime," reports one user. "No maintenance in a year and a half of heavy service," reports another.

You can have these same startling savings on walkie truck costs in your own plant, in addition, of course, to savings up to 80% on handling costs. Let us show you! Write for Bulletin A.



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BOOKS...

For copies of books and booklets reviewed, write directly to publisher listed.

. . . Executive Problems and How to Face Them

Executive Action

EDMUND P. LEARNED, DAVID N. ULRICH, DONALD R. BOOZ. Harvard University, Graduate School of Business Administration, Div. of Research, Boston 63, Mass. Index. 218 pp. $3.25

For executives and executives-to-be, this book gives the results of a 2-year investigation by the authors and two assistants in 12 companies in various parts of the country. The information was obtained by interviewing and observing people at work.

Section I deals with the executive's world, emphasizing the human factors in the background of executive action. It calls attention to the fact that the executive is generally concerned with a great many questions which, in one way or another, involve his relations with people. Because of today's pressures, his primary concern is not, unfortunately, with human relations but with operating forces. Often he becomes acutely aware of the human factors only when they seem to prevent him from getting the job out at the right time and at acceptable cost.

The author's description of the official ukase issued by the newly appointed vice president in charge of purchasing, who wanted his weight felt immediately, would be funny if it were not so tragic in its results. He notified all his purchasing agents in the various districts that from here on in he would approve all purchases of $10,000 or more. This was a new deal as far as the old-time purchasing agents were concerned and the new V.P. found himself faced with an executive sitdown strike. The impact of a sudden unannounced move got for him an extremely hostile reaction.

Section II covers the executive's actions in regard to controls, organization charts, communications, and the use of staff organization. It focuses attention on the fact that one of the critical tests of the administrative ability of the executive lies in the way he uses staff assistants. We may write up job descriptions in manuals which exactly define relations of the

More on next page

Now, more than ever you need an RCA SOUND SYSTEM

WITH THIS MODERN MEANS of communications installed in your building and grounds you save the time of busy executives, speed production efficiency, tone-up worker morale, expedite shipping, have instant communication with anyone or everyone in emergencies.

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Just press a key—and talk! Eliminates time-consuming trips between departments and waiting for individuals to come to your office, relieves telephone switchboard congestion. It will save you at least one-half hour a day of your working time—enable you to get things done quickly, more conveniently.

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Application Engineering Offices in All Principal Cities

BOOKS . . .

Begins on page 280

individuals in the jobs described, but the manuals will not automatically develop smooth relationships with the overall organization. Too many staff people have difficulty getting along with their associates because they are not fully aware that they exist for the purpose of dealing with problems which people in the line organization have neither the time nor the specialized knowledge to handle. The writers point out effectively that usually the staff man has no right to issue orders or give directions in his own name.

The authors do not attempt to solve the problems they outline. The reader has to think and try to solve them himself.

—Harold Engstrom, Chief Industrial Engineer, Sylvania Electric Co.

. . . What to Look for in Your Employee Benefit Plan

Employee Benefit Plans in Operation

JAY V. STRONG. Bureau of National Affairs, Inc., 1231 24th St., N.W., Washington 7. Table, appendices, index. 348 pp. $5.

This is an "ask the man who owns one" story about the values and problems of that hot industrial relations issue — the employee benefit plan. Questions answered for you are: What should you plan for in pensions, medical benefits, and workers' insurance? What questions arise after the plan is in effect? How do various plans prove out under day-to-day testing? Conclusions are based on a survey of 923 companies.

. . . What Does the Law Say on Your Labor Problem?

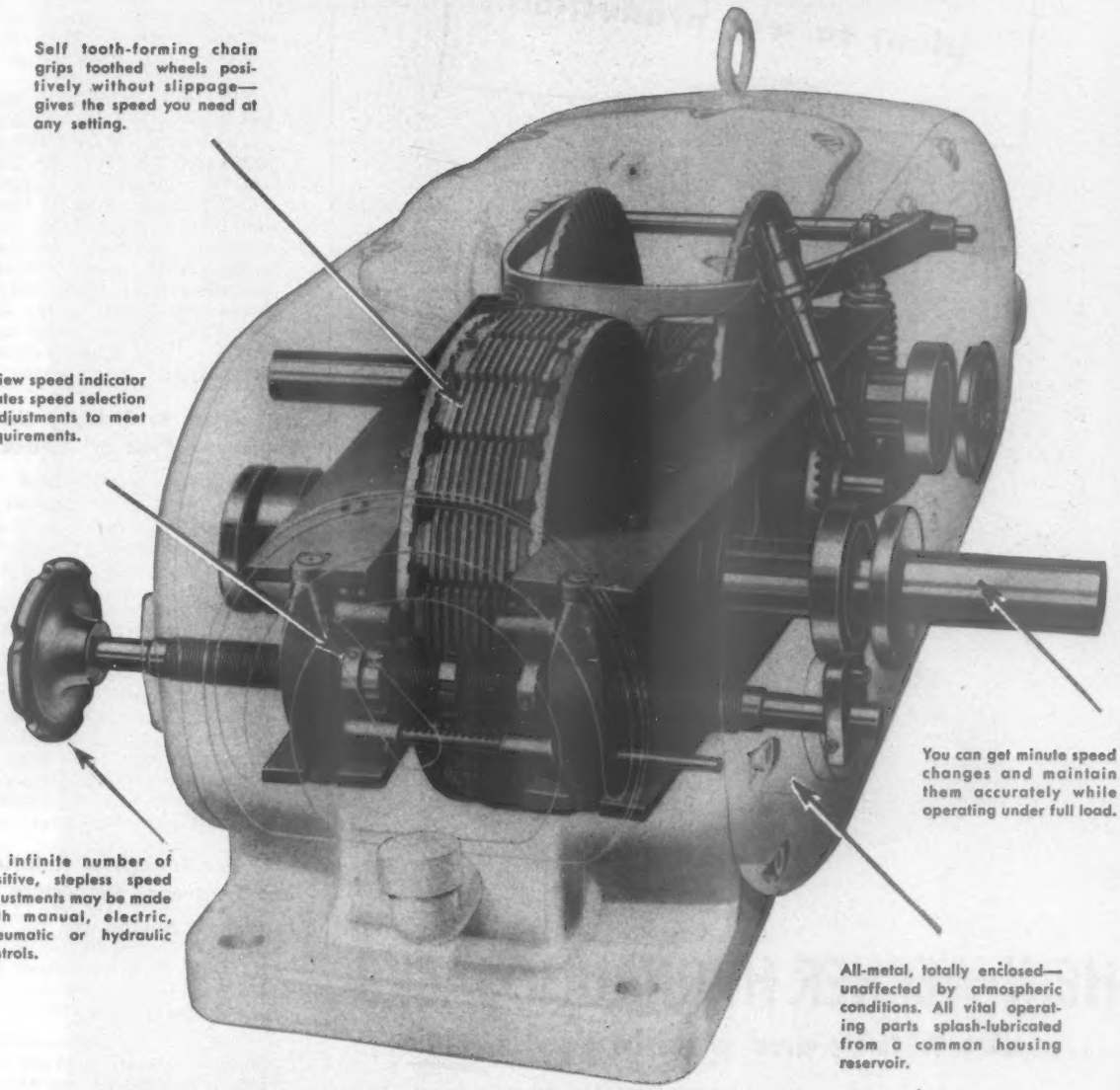
The Law of Labor Relations

BENJAMIN WERNE. The Macmillan Co., 60 Fifth Ave., New York City 11. Legal references, index. 471 pp. $5.75.

Here's a convenient guide to help you keep your labor-management relations on a sound basis. Four main sections deal with representation, unfair labor practices, rights and obligations of management and labor and collective bargaining. In each case the applicable law is stated, examples are given, and authorities cited.

More on next page

Only the P.I.V. gives you all these advantages in a variable speed drive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...make lifting and pushing jobs *easier*!

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BOOKS...

Begins on page 280

. . . For Personnel and Other Top-Level Executives

Selecting and Inducting Employees

GEORGE D. HALSEY. Harper & Bros., 49 E. 33rd St., New York 16. Sample forms, tests, letters, advertisements, job analyses; references; tables; case examples; sources; index. 361 pp. $4.50.

"There is usually a suitable job for almost every person, one in which he can be successful and happy." So says Mr. Halsey, and he then goes on to describe all the things that go into the finding of that job. Interviewing, testing, statistical techniques, employment forms — these and all other hiring and induction procedures come in for discussion. The author backs up his views with actual case examples from dozens of companies.

. . . Hints to Sharpen the Engineer's Plan of Attack

The Engineering Method

JOHN CHARLES LOUNSBURY FISH. Stanford University Press, Stanford, Calif. Tables, charts, diagrams, illustrative examples, index. 186 pp. $3.

The great Steinmetz once said, " . . . the most important part of engineering work is the determination of the method of attacking the problem, whatever it may be." The author's answer in this text is simply "trained and organized common sense" applied in a systematic manner. The author outlines a basic approach to practical problems.

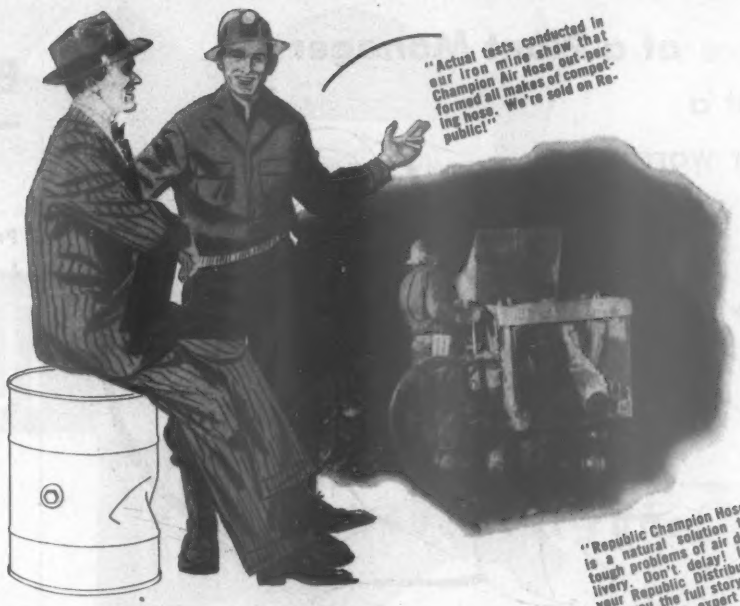
. . . For Industrial Relations and Personnel Executives

Industrial Sociology

DELBERT C. MILLER and WILLIAM H. FORM. Harper & Bros., 49 E. 33rd St., New York 16. Diagrams, charts, tables, graphs, indexes. 896 pp. $6.

The authors, well-known sociologists, present a study of the interrelationships between the worker and his social environment. They outline and discuss in detail the adjustments confronting the worker over his working life—from his preparation for work to and including his retirement. The role of the professional sociologist in industry is considered.

More on next page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An oil-resistant Reprene tube, a rubber-insulated, premium high-tensile braided carcass and a resilient yellow safety cover make Champion Air Hose the toughest product of its class anywhere in the world.

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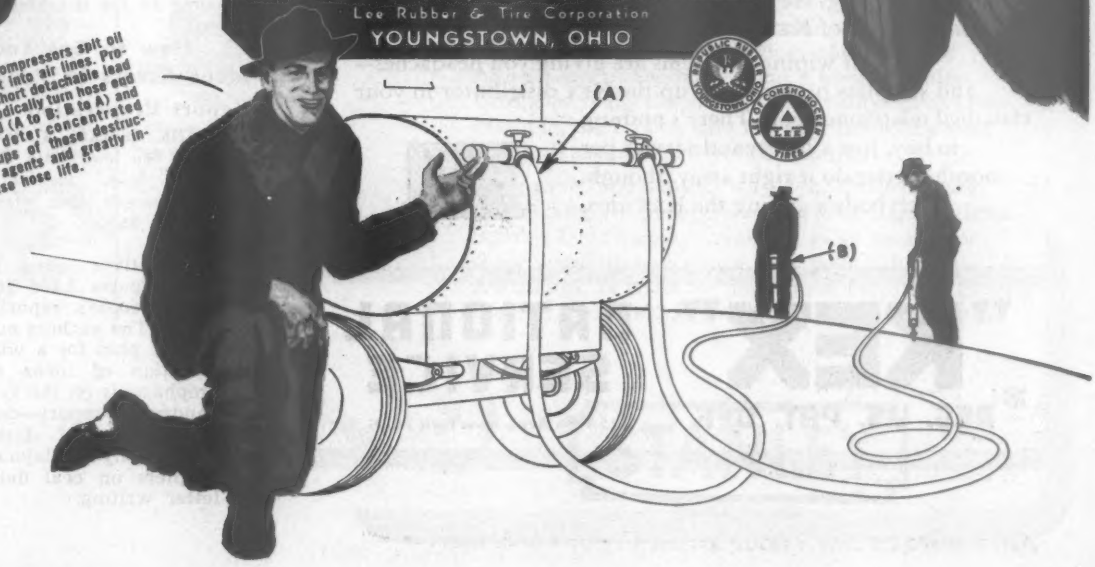
"Most compressors spit oil and heat into air lines. Provide a short detachable lead or periodically turn hose end for end (A to B; B to A) and you'll deter concentrated buildups of these destructive agents and greatly increase hose life."



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So if wiping problems are giving you headaches—and sleepless nights—look up the KEX distributor in your classified telephone book. There's nothing to buy, just a low rental service per month. Better do it right away, though. Everybody's getting the KEX idea.

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BOOKS...

Begins on page 280

. . . What's New in Personnel Practices and Labor Relations

Labor Relations Work Kit

Edited by LAWRENCE STESSIN and the staff of Employee Relations Bulletin. National Foreman's Institute, Inc., Deep River, Conn. Illustrations, charts, sample forms and questionnaires, case examples. 224 pp. $7.50.

This ring-bound looseleaf kit brings you a listing of workable solutions that other companies have developed to meet current employee relations problems. You'll find no theoretical discussions. Just a statement of the problem—and the step-by-step "how to do it" procedure used in tackling it.

. . . A Look at the Structure of Our American Economy

Monopoly and Free Enterprise

GEORGE W. STOCKING and MYRON W. WATKINS. The Twentieth Century Fund, 330 W. 42nd St., New York 18. References, table of cases, index. 596 pp. $4.

This extensive survey studies the present-day conflict between concentrated economic power and the theory and practice of free enterprise. The authors outline the forces limiting free competition, and try to evaluate their social and economic effects. Price leadership, basing point system, trade association, anti-trust policies, and patents all come in for discussion.

. . . How to Get Your Ideas Across on Paper

Report Preparation

FRANK KEREKES & ROBLEY WINFREY. The Iowa State College Press, Ames, Iowa. Illustrations, tables, charts, sample forms, references, index. 448 pp. $6.90.

Executives often find their own reports hard to prepare, other people's reports hard to digest. The authors outline here a basic plan for a winning presentation of ideas and facts. Emphasis is on the typewritten, handmade report—on effective organization of data and attractive physical layout. Includes chapters on oral delivery and letter writing.

No. U214A
Operates at speeds as high as 20 feet per minute, up to 14 Gauge steel.

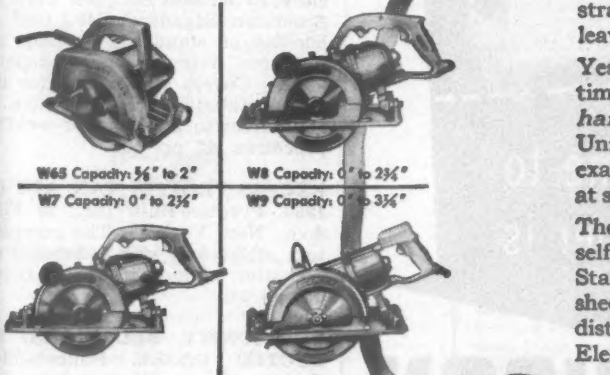
CUT production corners;

TRIM hours off runs;

EDGE more smoothly...

with STANLEY UNISHEARS

STANLEY SAFETY SAWS FOR SHIPPING AND MAINTENANCE WORK



W6S Capacity: 5/16" to 2"
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Stanley Unishears make it as easy to maneuver tricky curves, angles and notches as it is to hew a straight line. Moreover, these powerful, portable snips leave a clean, smooth, even edge along the entire cut.

Yes, and when it comes to clocking them against time-consuming, labor-wasting, old-fashioned *hand-snip* methods . . . that's where Stanley Unishears really demonstrate their superiority! For example, the U214A cuts 14 gauge hot rolled steel at speeds as high as 20 feet per minute.

They save time another way, too. Unishears are self-feeding. All the operator has to do is guide them. Stanley Unishears are available in 10 models for sheet metal up to 6 gauge. Ask your industrial distributor, or write for descriptive literature. Stanley Electric Tools, 407 Myrtle St., New Britain, Conn.

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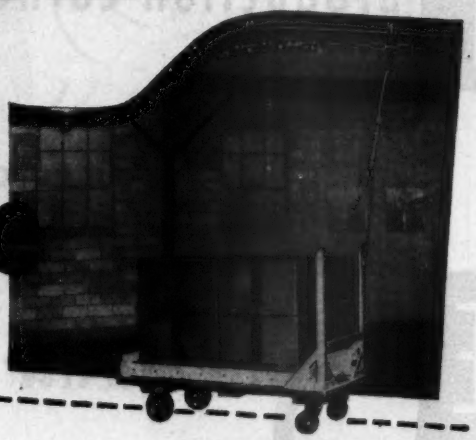
peace



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the original

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BOOKLETS

Begins on page 280

WAGE POLICY AND PROBLEMS IN A PREPAREDNESS ECONOMY. American Management Assn., 330 W. 42nd St., New York 18. Personnel Series No. 136. Five papers, including one entitled "The Thinking Behind the 1950 General Motors Agreement." 35 pp. Members, $1. Nonmembers, $1.25.

FEDERAL LABOR LAWS AND AGENCIES. Supt. of Documents, Govt. Printing Office, Washington 25, D.C. Bulletin No. 123. A layman's quick reference guide to important federal labor laws and regulations. Lists government agencies and services available to management and labor in the field of labor relations. 99 pp. 30c.

HANDBOOK OF TECHNICAL DATA ON SPRINGS. Accurate Spring Mfg. Co., 3811 W. Lake St., Chicago 24, Ill. A compact data book on springs for busy design engineers. Lists design formulas, load deflection tables, wire sizes, and commercial tolerances. 40 pp. Free

RENEGOTIATION OF DEFENSE CONTRACTS. National Planning Assn., 800 21st St., N.W., Washington 6, D.C. Special Report No. 2 Brief discussion of renegotiation and excess profits—with six recommendations for an improved renegotiation law. 20 pp. 15c.

SAFETY IN ELECTRIC AND GAS WELDING AND CUTTING OPERATIONS. American Welding Society, 33 W. 39th St., New York 18 American Standard Z49.1-1950. A booklet of standards to help cut lost-time injuries and property losses. Covers regulations for the safe installation and operation of equipment in all types of welding processes. 42 pp. 50c.

EXCESS PROFITS TAX ACT OF 1950. Prentice-Hall, Inc., 70 Fifth Ave., New York 11. The complete text of the act, with a detailed explanation of how it works. Index 159 pp. $1.

COMMUNITY RELATIONS: SELECTED CASES. Policyholders Service Bureau, Metropolitan Life Insurance Co., 1 Madison Ave., New York 10. Case histories of the community relations programs of companies. Outlines problems met and techniques used in public relations. Illustrated. 55 pp. Free to policyholders; also, limited supply for company executives.

American Blower . . . a time-honored name in air handling

In Seattle, a leading university, as well as commerce, industry and public utilities, have made use of American Blower's Branch Office by calling Seneca 5860. To contact the American Blower Branch Office in your city, consult your phone book.

PLEASANT IDEA . . .

In Seattle, as in your home town, apartment house owners realize that invigorating, fresh air indoors can do much to attract desirable tenants. American Blower Utility Sets do just this. The Utility Set is ideal for general ventilation where duct systems are required. It can be used as a supply or exhaust fan and is equipped with Aileron Control for regulation of air flow. They're available as standard packaged units ready for immediate installation. Is there an idea here for you?

PROFITABLE IDEA . . .

Fuel savings alone often will pay for a new heating system when you replace obsolete equipment with American Blower Unit Heaters. For example, a manufacturer of specialty equipment investigated and found he could convert his whole plant to unit heaters and pay for the system in 3 years with the fuel savings alone. American Blower carries a complete line of Unit Heaters, including gas-fired models and models for steam or hot water heating systems, wall- or ceiling-mounted.

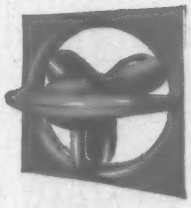
FRESH IDEA . . .

We know an advertising agency in one of our larger cities that recently moved their offices into one of those beautiful old homes along the river. The ventilating system was adequate for a family, but converting it for commercial use posed some problems. But American Blower equipment solved them nicely. For example, smartly-styled Aeropel Fans now keep the conference rooms pleasantly fresh, Utility Blowers ventilate rest rooms, and Ventura Fans handle the large work areas. End result, they say—fresh air fosters fresh ideas.

MAY WE SERVE YOU?

American Blower heating, cooling, drying, air conditioning and air handling equipment can do much toward improving comfort and efficiency in your business. For data, phone or write our nearest branch office.

Unit Heaters



Ventura Fans

Air Conditioning Equipment

Industrial Fans

Utility Sets

AMERICAN BLOWER CORPORATION, DETROIT 32, MICHIGAN
WEST COAST PLANT: SAN LEANDRO, CALIFORNIA

Division of AMERICAN RADIATOR & Standard Sanitary CORPORATION

YOUR BEST BUY AMERICAN BLOWER AIR HANDLING EQUIPMENT

Serving home and industry: AMERICAN-STANDARD • AMERICAN BLOWER • CHURCH SEATS • DETROIT LUBRICATOR • KEWANEE BOILERS • ROSS HEATER • TONAWANDA IRON

Now— simplify tough PULLING jobs!

(Save the tool cost in one operation!)

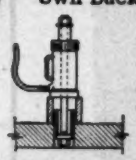
New—7 Complete Units • 10 to 100 Tons Capacity

SIMPLEX Re-Mo-Trol Hydraulic "Center-Hole" PULLERS

PUMPS AND REMOTE CONTROLLED RAMS

It's the "Center-Hole" That Does the Job*

An exclusive Re-Mo-Trol improvement! Ram plunger is tubular. A pull rod or screw inserted through the ram and secured to object being pulled is drawn in a straight line *directly through* the Ram—simplifies rigging and provides its own back-up.



Removing sleeve with Re-Mo-Trol, using supporting cage, pulling screw and back-up washer. Direct pull quickly draws sleeve from cylinder.

**On Rams of 30-tons or greater capacity.*

DIRECT LINE PULL
No torque or side thrust. Requires up to 75% less effort—lets you do bigger, harder pulling jobs easier.

FEWER FIXTURES NEEDED
Simplifies rigging. The Re-Mo-Trol Ram acts as its own back-up and is self-supporting.

SAFER, HANDIER POWER
Operator is always at safe distance. Re-Mo-Trol can be used where lack of space or difficult positioning prevents use of self-contained jacks or pullers.

GREATER UTILITY
Light in weight, easily portable. Operates in any direction—up, down or sideways!

Write for Bulletin: Hydraulic 51

Simplex
LEVER • SCREW • HYDRAULIC
Jacks

TEMPLETON, KENLY & CO. • 1018 S. Central Avenue, Chicago 44, Illinois

INDUSTRIAL FILMS

. . . Do you have a film or films that might help management do a better job? Help employees learn their job faster, better? If so, tell us about it and we'll pass the information on to those who can use what you have.

Effective methods of defense against the atom bomb are dramatically shown in **Pattern for Survival.** The film stresses the dangers of fear and panic and explains just what can be expected when an atomic explosion occurs. The film shows how to construct a home shelter and how to make up a home "survival kit." What to do in case you are caught in the open or in the office when an attack occurs is also illustrated. 16mm., in color, runs 21 min. Available from:

Cornell Film Co., 1501 Broadway, New York 18.

Measuring Executive Value is a new sound-slide film developed for the training of supervisors, foremen, and department heads. It's designed to show that effective supervision cannot be measured by how hard a supervisor works—but rather by what he accomplishes. And it shows how he can accomplish more. 35mm., 126 pictures. This is one film in a series entitled, "Thoughts on Management." For full information, write:

Film Research Associates, 135 W. 52nd St., New York 19.

There's a complete training guide available on grinding wheels and their use. Here are some of the titles: **The Grinding Wheel — It's Care and Use, Grinding Wheel Markings, The Cylindrical Grinder, The Surface Grinder, Grinding Wheel Safety.** They're all 16mm., color and sound. Running times from 14 to 31 minutes each. For further information on these and other films on grinding, write:

Norton Co., Publicity Dept., Worcester 6, Mass.

Safety in the Shop dramatizes typical shop accidents and shows how poor supervision or inadequate training may be the real cause. Emphasizes the supervisor's responsibility in teaching and maintaining safe practices. 16mm., black and white.

Association Films, Inc., 35 W. 45th St.. New York 19.

The sleeper that took the 12 noon plane

Would you have been caught napping in a situation like this?

Suppose you were in the fashion business. You have just created a line of women's nightgowns that are going to be given an unexpected publicity break in some top national magazines. This will mean more sales all over the country. But you must get more merchandise to the stores in a hurry — or forever lose your golden chance to get sales.

What would *YOU* do?

This happened to one company recently — but the problem caused them to lose no sleep. Faced with this situation at 10:30 A.M. they were able to start goods flowing to the stores on planes that left at noon.

The answer was Air Express!

But you don't have to be in the fashion business to profit from the regular use of Air Express. Here are its unique advantages which any business can enjoy:

IT'S FASTEST — Air Express gives the fastest, most complete door-to-door pick up and delivery service in all cities and principal towns, *at no extra cost.*

IT'S MORE CONVENIENT — One call to Air Express Division of the Railway Express Agency, arranges everything.

IT'S DEPENDABLE — Air Express provides one-carrier responsibility all the way and gets a *receipt upon delivery.*

IT'S PROFITABLE — Air Express expands profit-making opportunities in distribution and merchandising.

For more facts call Air Express division of Railway Express Agency.

AIR EXPRESS

GETS THERE FIRST

336* reasons why . . .

*Individual cutters on 16" Revo-tool accessory drum for model "K" Tennant Floor Machine. Available in various types and sizes.

YOUR FLOORS CAN BE CLEANED *FASTER* WITH A TENNANT INDUSTRIAL FLOOR MACHINE

When these alloy steel cutters, mounted on the spinning drum of a Tennant Floor Machine, bite into thick incrusted grime—small wonder it literally *vanishes!* Hardened grease and tar, granite-like cement splashes, thick accumulations of dried paint, chips, metal cuttings—all are sheared from floors by the high speed pulverizing action of the Tennant *Revo*-tool.

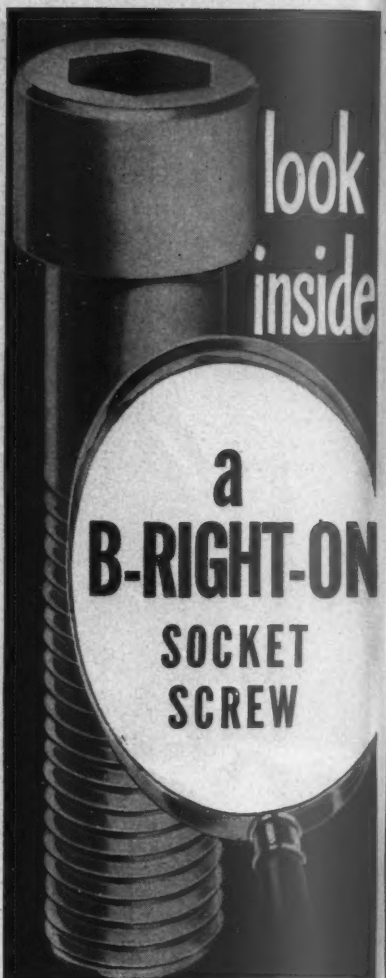
REMOVES ALL GRIME IN 1 FAST OPERATION

With this rugged, drum-mounted accessory on a powerful, heavy-duty Tennant Industrial Floor Machine, *one man alone* can clean any factory floor in a few minutes. ● This operation cuts soilage loose and picks it up at same time . . . leaves floors clean, dry, ready for traffic . . . cuts cleaning costs . . . eliminates need for soap, water, chemicals or scraping . . . doesn't interfere with plant operation. ● Available in gas or electric models for 12" or 16" drum accessories.

WRITE TODAY for new illustrated bulletins on Tennant Industrial Floor Machines for heavy industry applications. Specify 12" or 16" accessories; gas or electric power.

G. H. TENNANT CO.
2554 2nd STREET NORTH
MINNEAPOLIS 11, MINNESOTA

REVO-TOOL attachment pictured above. Ideal for heavy soilage.
WIRE BRUSH, 20, 30 or 39 ga. steel; diagonal pattern, won't clog nor streak.
STEEL WOOL roll for high speed dry cleaning of wood floors.
Other drum accessories for sanding, polishing, scrubbing.
The way to finer floors
TENNANT
Floor Maintenance System



There's more than meets the eye in a Brighton Socket Screw! Brighton Nu-Process, an entirely new metal working process, forms special alloy-steel into screws with continuous unbroken fibers and fine, compact grain. This greater toughness allows greater strength and hardness.

New catalog now ready. Write for your copy.

The BRIGHTON SCREW & MANUFACTURING CO.
Reading Road opposite Deer Creek
Cincinnati 2, Ohio

BRIGHTON
Screw & Mfg. Co.

Blue it...

Mark it...

Saw it...

. . . that's all you have to do with

SIMONDS

FLAT GROUND DIE STEEL

(Flat Ground Stock)

. . . to make dies, punches, templates, gages, jigs, fixtures and machine parts

You can bank on this *oil hardening, non-deforming* type flat ground steel to be uniformly annealed and to have a uniformly low micro-inch surface finish needed for accurate layout work. Ends of the standard 18" lengths are milled square. No machining operations are required to size Simonds "Red Streak" Flat Ground stock and Die Steel . . . so you save time and money right from the start.

Another feature is its wide hardening range (1450° to 1540°), which insures consistently uniform results. Each piece is individually packaged, plainly marked as to size, and includes heat-treating instructions. Now furnished in a wide range of sizes up to 36" x 10" x 1½", you can get immediate delivery of most sizes from your Simonds Distributor.

FITCHBURG, MASS.

Branch Offices in Boston, Chicago, San Francisco and Portland, Ore.
Canadian Factory in Montreal, Que.

IMPORTANT NEW CATALOGS

For Your Working Library . . .

. . . a carefully selected list of manufacturers' bulletins and catalogs to help you keep up to date on new cost-cutting equipment. Tell us which ones you want. Circle the numbers on the coupon on page 300.

Dust Collectors

1 A new 38-page catalog describes the entire line of Dustkop dust collectors for controlling dry grinding, dust, chips, and shavings from both metal and wood working machines; also control of mist from wet grinding. Illustrations of typical problems, with recommendations. Catalog also describes and prices accessories. Aget-Detroit Co.

Car Shaker

2 The Allis-Chalmers car shaker unloads granular material from hopper-bottom gondola cars. The manufacturer recommends it to save time and money, to protect personnel in steel mills, coke plants, paper mills, etc. It's described in detail in the bulletin, "Allis-Chalmers Car Shaker." Allis-Chalmers Mfg. Co.

Bronze Electrodes

3 "Welding With Ampco Bronze Electrodes" is the title of a 24-page booklet describing welding techniques and procedures, along with specific applications of various bronze electrodes. Ampco Metal, Inc.

Dry Chemical Fire Extinguisher

4 Dry chemical will put out fires in electric motors and prevent further spread of the fire through the softened resin, according to Ansul. A new technical leaflet describes effect of the chemical on motors, method of cleaning when fire is out. Ansul Chemical Co.

Air Vise

5 A foot-controlled air-operated air vise, capable of up to 1200 operations per hour, according to the maker, is described in a new leaflet. W. R. Brown Corp.

Fork Trucks

6 In "The New Baker Type FT Fork Truck" (8 pages) you will find detailed specifications, pictures, and descriptions of features and applications. Illustrations of special attachments. Baker Industrial Truck Div., The Baker-Raulang Co.

Megger Ground Testers

7 Megger ground resistance and earth resistivity measuring instruments are described in a new 20-page bulletin. Contains information to help you solve electrical power and communication grounding problems. James G. Biddle Co.

Liquid Level Gages

8 A new 24-page bulletin may supply answers to your problems of measuring and recording water depth in reservoirs, process storage tanks, etc. Describes types of gages for various liquids and solutions, whether flowing, corrosive, carrying solid matter, or otherwise special; also tells about remote recording and automatic pump control instruments. The Bristol Co.

Chain Drives

9 Engineers and maintenance men can get information from a new handbook on how to install and maintain roller chain and pitch conveyor chain. It contains hints on lubrication, length conversion tables, horsepower rating charts, list prices, and specifications. Atlas Chain & Mfg. Co.

Steam Generator

10 A new packaged-type water tube steam generator is described in a large folder which includes specifications, schematic drawings. Erie City Iron Works.

Corrosion-Preventive Wrapper

11 Booklet on Nox-Rust vapor wrapper tells how various companies protect their products without greasing or coating. 20 pages of pictures and descriptions. A separate wall chart describes various wrappings, minimum protection each gives. Government specification numbers and equivalent Nox-Rust designations for rust preventive compounds. Nox-Rust Chemical Corp.

Electric Controls

12 If you need a pushbutton for a hazardous location you may be interested in a new 8-page catalog. Illustrations and descriptions of other types also. The Electric Controller & Mfg. Co.

Coolant Spouts

13 An easily adjustable coolant spout that needs no support is described in a new brochure. Illustration shows application, specifications. J. N. Fauver Co., Inc.

Lubrication Data Book

14 Pocket-size 54-page booklet, "Lubriplate, The Modern Lubricant," describes types of lubricant, how to apply. Specific recommendations for equipment in various kinds of plants. Fiske Bros. Refining Co.

Cranes, Tramrails

15 Installation photograph of a line of cranes, transfer bridges, and tramrail systems are included in a 4-page bulletin. It also tells the story of the new "shielded electrification system" for motorizing. Maker furnishes specification detail sheets for figuring your own needs. The Forker Corp.

More on next page

HERE'S THE CRANE FOR

CONSTANT SERVICE *at* HIGH SPEED

If your handling operations must be "on the go all the time and fast, too", then investigate this American MonoRail Crane. Coupled with constant service at high speed, it offers the advantages of easy movement, rugged construction, low-cost operation and quick installation. But the No. 1 advantage is articulated trolleys. When each trolley wheel carries its share of the load in perfect alignment with the craneway tracks and all possible friction is eliminated, the result is perfectly articulated trolley travel. Applied to American MonoRail Cranes, these articulated trolleys permit operating speeds of 500 feet per minute and constant service. Breakdowns are practically eliminated and the crane is ready for fast service at all times.

An American MonoRail engineer will gladly give you all the details, or write us about the American MonoRail Constant-Service High-Speed Crane.

THE AMERICAN MONORAIL COMPANY

13114 ATHENS AVENUE CLEVELAND 7, OHIO

CASE No. 417
Bearing Manufacturer

INSTALLATION COSTING $3,475

. . . paid for itself in one year . . .
Principle applied to four plants

(a) Savings in Effort (estimated) 20%
(b) Savings in Time.....50%
(c) Savings in Space (estimated) 10%

QUOTING CUSTOMER'S* STATEMENT:

"We started with a short section of gravity roller conveyor between a production milling machine and double stand grinder handling castings that average 25 lbs. Our former production was 1200 pieces. As a result of the conveyor, this has been increased to 2400 pieces with a maximum of 2800 pieces attained in 8 hours. The handling was previously done by using a channel chute into a box and grinders had to pick-up work from this box before they could handle the piece on the grinding wheel. With the conveyor line installed, work comes at a convenient height so that the operator grasps the next piece with little effort. The first unit paid for itself in one week. Result: Roller conveyor was extended between all operations in the finishing department. Savings paid the cost of the system in one year."

*Name on Request

Here's a true case history where production was more than doubled by the installation of a Logan Conveyor system. If you have a handling problem write us. You may find an answer in this book, "Key to Lower Costs." Send for it today. ——→

Logan Conveyors

LOGAN CO., 510 CABEL ST., LOUISVILLE, KY.

NEW CATALOGS FOR YOUR WORKING LIBRARY

Begins on page 294

Ammeters

16 An illustrated 8-page brochure tells how "Tong-Test" ammeters measure a.c. or d.c. current without breaking circuit, scraping insulation, or even touching conductor to be tested. Pictures and descriptions show uses of various types. Columbia Electric Mfg. Co.

Metal Shaper

17 Bulletin on the Delta-Milwaukee 7-in. precison metal shaper tells what it can do, what extra equipment is available. Complete specifications and catalog listings. Delta Power Tool Div., Rockwell Mfg. Co.

Heat-Treat Furnace

18 Low-priced furnace of modern design is described in a 6-page folder. Diagrams show the cross-flow circulation of heat. Features of other models are described and illustrated. Despatch Oven Co.

Oscillograph

19 An oscillograph for industrial testing is illustrated and described in an 8-page brochure. Other models and accessories. Midwestern Geophysical Laboratory.

Corrosion Inhibitor

20 A corrosion inhibitor for use where de-ionizers or sodium-hydrogen zeolite softeners are not economically feasible, is described in a new 2-page information bulletin. Allis-Chalmers Mfg. Co.

Portable Electric Tools

21 You can get information about drills, nut runners, buffers, and grinders of various types in a new 12-page catalog, with pictures and specifications. Buckeye Tools Corp.

Electric Hand Dryers

22 Here's one answer to the problem of keeping your washrooms clean and sanitary. An illustrated 4-page brochure tells about various types of dryers for industrial use. The Chicago Hardware Foundry Co.

Corrosion-Proof Linings

23 Bulletin describes complete line of corrosion-proof linings: sheet linings, solution or dispersion linings, brick sheathings, and others. Atlas Mineral Products Co.

More on next page

NOW more important than ever to you

You are, or may soon be, shifting your production setup to meet the country's rearmament needs. New machines, new operations, and faster production schedules will demand some revision of your lubrication practices. That's why Standard's Service-Supply organization is now more important than ever to you.

Standard has a service-supply warehouse within a short truck-hauling distance from your plant.

If you are a Standard Oil customer this warehouse will stock every lubricant used in your plant. Deliveries can be made in a few hours if necessary.

In addition, this service-supply center is headquarters for a Standard Oil lubrication specialist who is assigned to your plant. He is close at hand to give you help when you need it. He has plenty of practical experience. He has been specially trained for his job in a Standard Oil Lubrication Engineering School. He is backed by Standard Oil's extensive research and technical facilities.

To arrange for his visit, phone your nearby Standard Oil Service-Supply center or write to: Standard Oil Company (Indiana), 910 South Michigan Avenue, Chicago 80, Illinois.

STANDARD OIL COMPANY (INDIANA)

STANDARD

Flexible Rugged

to meet your requirements

to withstand years of hard service

EXCLUSIVE CASTOR ASSEMBLY
Improved plate type ball bearing castor. Forged steel fork held on by special king bolt with castellated nut adjustment. Correct castor lead. Wheel roller bearing mounted.
REAR AXLE BRACKETS
Steel brackets welded to frame. Flat stock saddle support for inner sills.
FLOOR BOARDS
Full 1" thick dressed hardwood crosswise within frame flanges. Wood bevel strip or optional flush metal hold down each side.
SAFETY SELF-COUPLER
Safe, quick-acting, efficient. Other types available if desired.
ALL STEEL FRAME
Arc welded assembly. Not a single nail, bolt or wood screw in the entire assembly.
WHEELS
Molded-on solid rubber tired. Cast steel type optional.

MERCURY A-310 CASTOR STEER TRAILERS

Type "A-370" with steel dump body

Type "A-310" with corrugated steel box body

Standardized in design...proved in service...flexible to meet your requirements. Fabricated and assembled in the largest and most completely equipped industrial trailer plant — the MERCURY A-310 castor steer trailer is constructed from standardized material, by standardized processes, *but* flexible in size, deck construction, hitch detail, wheel type, etc., to meet the particular demands of your operations.

For complete description and specifications of the MERCURY A-310 Trailer as well as Mercury special type trailers request Bulletins 160 and A-999.

THE MERCURY MANUFACTURING COMPANY
4110 S. Halsted Street, Chicago 9, Illinois

NEW CATALOGS FOR YOUR WORKING LIBRARY

Begins on page 294

Heat-Absorbing Glass

24 "Coolite" is the title of a 16-page brochure describing two types of heat-absorbing, glare-reducing glass. Pictures show industrial installations. Specifications and recommendations on glazing procedures. Mississippi Glass Co.

Gaskets

25 You'll get an introduction to Teflon, its properties and uses, and the forms in which it is now available in a new 48-page catalog that covers the more familiar types of gaskets too. There's also information about Teflon electrical parts, Teflon-covered rollers, etc. U. S. Gasket Co.

Acoustical Tile

26 Application data for textured and perforated tile is included in an 8-page illustrated brochure, described as a design data sheet. Owens-Corning Fiberglas Corp.

RLM Lighting Specifications

27 "How to Specify RLM Labeled Lighting Units" is shown in chart-form in a new 4-page brochure. It lists all manufacturers and RLM-certified lighting equipment made by each. RLM Standards Institute, Inc.

Toilet Compartments

28 Toilet and dressing room compartments, shower stalls and cabinets are described in a 20-page catalog that includes drawings of construction details, installation layouts. Tabular summary of information about various types, with color chips. The Sanymetal Products Co., Inc.

Breathing Equipment

29 "We Don't Need Breathing Equipment" tells how proper breathing equipment can save men and man-hours in maintenance and production operations. Eight case histories. Safety Equipment Div., Scott Aviation Corp.

Conveyors

30 New edition of a 24-page bulletin on belt, roller, and wheel conveyors. Specifications, installation information and drawings, table showing horsepower required to carry given loads. Standard Conveyor Co.

More on next page

Facts you should know about De Laval turbines!

This turbine has two traffic cops...

that give you double protection against overspeeding. The normal speed governor and overspeed governor are entirely separate. A sticky governor valve can't possibly jeopardize the operation of the overspeed governor and trip.

You can elect the governor that meets your requirements!

We have eight candidates for the job, so take your choice:

Mechanical Shaft governor with smooth-acting, long-wearing "rocking chair" action.

Vertical Mechanical governor geared to shaft for speeds above 4500 rpm.

Hydraulic Governor. Direct acting orifice-type for high speeds and/or wide range of speed adjustment.

Hydraulic Oil Relay for close regulation or for supplying extra power for valve movement.

Flyweight Oil Relay for close regulation such as encountered in synchronous generator drives.

Pressure Controls for constant pressure or differential pressure regulation of pumps, blowers, etc.

Speed Changers, manual or remote control by electric motor drive.

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Begins on page 294

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31 How to lift, push, or pull 10 to 100 tons with a pump and remotely controlled hydraulic ram is described in an 8-page illustrated brochure. Specifications and descriptions of attachments. Templeton, Kenly & Co.

Fork Truck Attachments

32 "Extra Hands and Arms for the One-Man Gang" (4 pages) tells how difficult handling problems can be met with special fork truck attachments. Illustrations. Towmotor Corp.

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33 If you want to weatherproof, waterproof, or just plain glamorize your walls you might take a look at several folders now available about Conduro (sand finish wall coating that's mildew resistant); and Tuff-Kote (waterproof, weatherproof, and pliable). The Nall Corp.

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34 Bulletin tells about a precipitating softener and coagulator in which energy for flock preparation is mechanical. Describes flow circuit, chemical feeders, dual-purpose pump, chemical proportioning system. Worthington Pump & Machinery Corp.

Vacuum Food Carriers

35 Containers for keeping hot foods and liquids hot, and cold ones cold, while they are transported and served, are described in a 4-page folder. Illustrations show various types, indoors and out. The company offers a free consulting service. Vacuum Can Co.

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36 A series of illustrated leaflets will give you information about aluminum roof coating; aluminum paint for interiors and exteriors; mastic flooring; and floor repair material. The Warren Refining & Chemical Co.

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37 The new Life-Line d.c. motors and generators are "taken apart" in a new 19-page booklet. On successive transparent pages you peel off housing, then the internal parts of the motor, to see its design for yourself. Booklet also describes types, enclosures, and mountings for different applications. Westinghouse Electric Corp.

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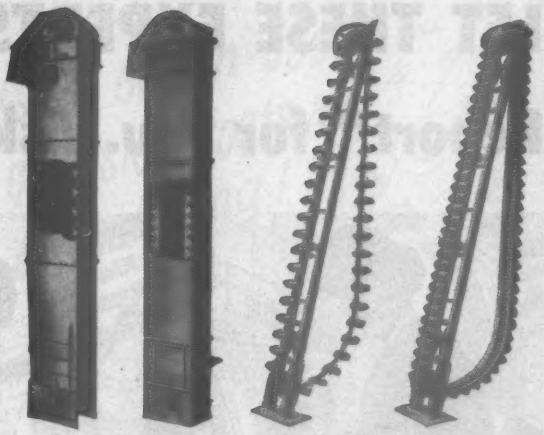

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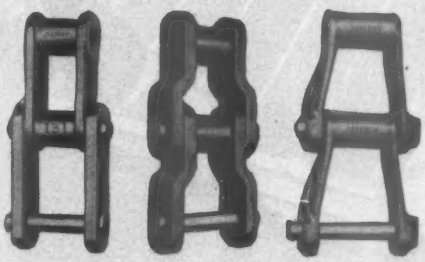

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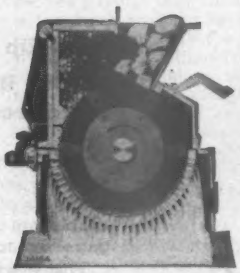

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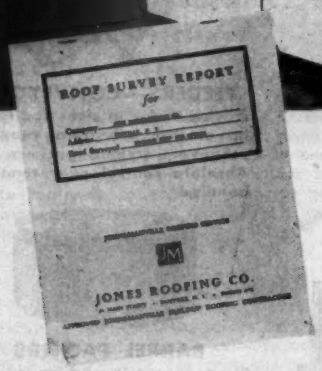
LET THESE EXPERTS make a "Roof Survey Report" for you. Ask about this free service.



The Built-Up Roof Survey tells exactly what condition your roof is in, gives you a permanent record, helps you plan ahead for roofing maintenance. Yours for the asking!

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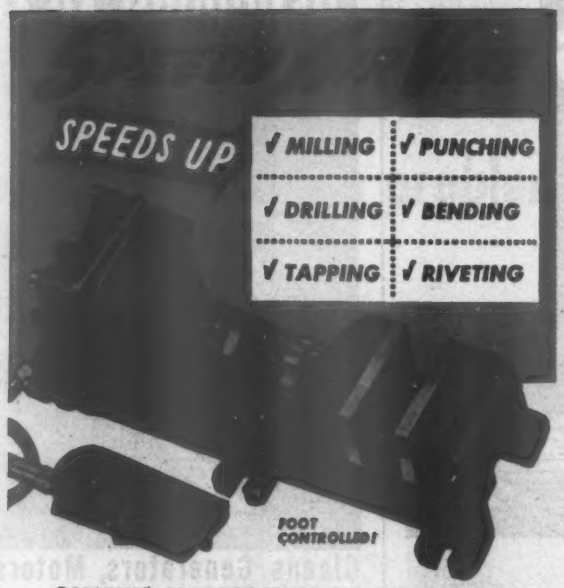

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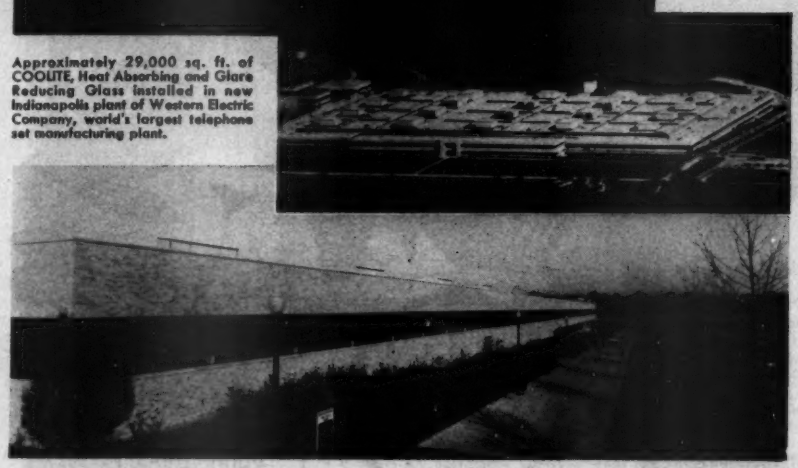
REDUCES TEMPERATURES ...CUTS GLARE IN THE MODERN FACTORY



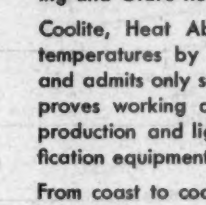
Approximately 29,000 sq. ft. of COOLITE, Heat Absorbing and Glare Reducing Glass installed in new Indianapolis plant of Western Electric Company, world's largest telephone set manufacturing plant.

Precision manufacture in the modern factory frequently calls for precise control of dust, ventilation, atmospheric pressure and, last but not least — heat and light.

Helping to control sunlight and solar heat transmission to meet exacting requirements is the function of COOLITE, Heat Absorbing and Glare Reducing Glass.

Coolite, Heat Absorbing and Glare Reducing Glass reduces temperatures by trapping and deflecting solar heat radiation and admits only softly diffused, comfortable daylight. Coolite improves working conditions as well as quality and quantity of production and lightens the load on air conditioning and humidification equipment.

From coast to coast architects and engineers specify this money saving glass in new construction and modernization. For details, see your nearby Mississippi Glass distributor.



Send for new catalog, "Coolite, Heat Absorbing and Glare Reducing Glass."

Rolled, Figured and Wired Glass by Mississippi is *"Visioneered"* for better daylight illumination. There is a pattern and surface finish scientifically designed to distribute light to best advantage in your plant.

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"CORN COB" Blast Machine

Cleans Generators, Motors

Faster Better Cheaper

Eliminates Toxic Hazard of Solvents!

THE new portable Pangborn AC-4 Blast Machine scours armatures, parts, frames, coils, etc. in 1/3 the time of other methods. Material costs are reduced 90% and toxic or explosive solvents are eliminated.

Look at the savings shown by this recent test on electric motors. (Name of Company on request.)

Cleaning Duplicate 500 hp Synchronous Motors		
	Material	Labor
Solvent Method	$55.00	120 hrs.
PANGBORN Method	5.00	40 hrs.
SAVING	50.00 (90.9%)	80 hrs. (66.7%)

Remarks: With Solvent, drying period took an additional 8 hours.

SIMPLE OPERATION

New Pangborn AC-4 Blast Machines use standard 40-pound air supply to remove oil and greases with blast of soft, 20-mesh corncob grits. No residue left on parts . . . no drying period.

FOR FULL INFORMATION, write today outlining your operation. Address: PANGBORN CORPORATION, 2100 Pangborn Blvd., Hagerstown, Maryland.

Look to Pangborn for the Latest Developments in Blast Cleaning and Dust Control Equipment

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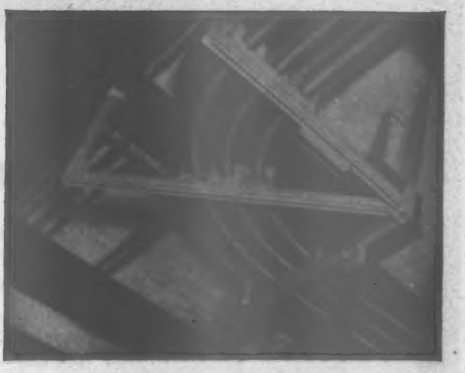
BLAST CLEANS CHEAPER with the right equipment for every job

Give installation problems...



How one manufacturer solved a difficult installation problem through the use of flexible interlocked-armor cable.

THE RUN-AROUND

with INTERLOCKED-ARMOR CABLE

Pillars, I-beams, piers, partitions, and other obstacles often interfere with the installation of new plant power circuits. Result? Expensive drilling, channeling and tricky layouts... extra plant downtime . . . increased over-all installation costs.

However, there *is* a simple low-cost solution—time-saving General Electric *interlocked-armor cable with the famous No. 1799 varnished-cambric insulation.* This self-protecting cable was specifically designed to facilitate installation of plant power circuits in difficult locations. A ready-to-install cable assembly, G-E interlocked-armor cable may be readily bent around obstructions. It can be strung over long runs without pull boxes. It need merely be laid up on existing beams or hung with wire brackets.

There's no further protection to fuss with. No complicated layouts to plan. No wire pulling. In some cases, you can actually save up to 50% on time, 70% on weight, and—at the same time—get improved circuit voltage regulation, through closer spacing of conductors. Investigate G-E interlocked-armor cable on your next power installation—it may pay you big dividends.

For complete data on General Electric interlocked-armor cable, write to Section W3-334 Construction Materials Department, General Electric Company, Bridgeport 2, Connecticut.

General Electric interlocked-armor cable runs around obstacles—needs no special installation techniques!

GENERAL ELECTRIC

Famous Firms save money with
PC FOAMGLAS
The long life insulation

PROMINENT USERS OF FOAMGLAS INCLUDE:
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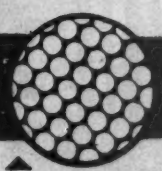
THE wide acceptance of Foamglas insulation—evidenced by a long list of prominent users—is due mainly to two facts. It is an effective insulation. It is an economical insulation.

Foamglas is composed entirely of glass and air in cellular form, thereby constituting an excellent retardant to heat travel. That is why Foamglas is such an *effective* insulation.

Because it is glass, Foamglas successfully resists elements that destroy other materials. Consequently, it provides long lasting insulating service, without costly repairs, maintenance, or replacement. That is why it is such an *economical* insulation.

Your firm too, can save money with PC Foamglas. Send for our recently published booklets and note the illustrations of actual jobs on which Foamglas has been used. See how the comprehensive specifications and instructions for the installation of PC Foamglas can be applied to your particular problems. Just mail in the convenient coupon and you will receive a sample of Foamglas and free copies of our booklets.

Here, PC Foamglas is shown in core wall construction—laid up between inner and outer masonry walls—at the new hog processing plant of Stadler Packing Company, Inc., Columbus, Ind. Strong, rigid Foamglas blocks insure a long lasting barrier to vapor and heat transfer . . . help maintain required operating temperatures of minus 5°F. to 38°F. in this building. Architect: Johnson and McKenney, Columbus, Ind.



This diagram shows how a group of glass bubbles which contain still air, can form a continuous, cellular material. PC Foamglas, the cellular glass insulating material, consists of glass and still air, making an excellent barrier to heat travel. And, being glass, Foamglas has unusually high resistance to moisture, vapor, fumes and acid atmospheres, is noncombustible, odorless and verminproof. In this cellular glass construction lies the secret of the long lasting insulation value of PC Foamglas.

Pittsburgh Corning Corporation
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Without obligation on my part, please send me a sample of Foamglas and your FREE booklets on the use of PC Foamglas Insulation for: Normal Temperature Commercial, Industrial, and Public Buildings ☐ Refrigerated Structures ☐.

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When you insulate with **FOAMGLAS** *... the insulation lasts!*

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VERSATILE
A general purpose cutter easily mounted and moved.

FASTER PRODUCTION
Designed for in-line production with balanced cutting action.

FEATURES
Sizes — 24" to 120". Foot pedal holding clamp. Easy blade change for sharpening.

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LIFTS shop grime from the pores gently but *thoroughly* — a *must* where hands come in contact with lubricating oils. Contains a sterilized vegetable emollient which acts as an absorbent. Non-irritating action keeps skin free of cracks where dermatitis gets its start. In powder form—bulks BIG at a very low cost.

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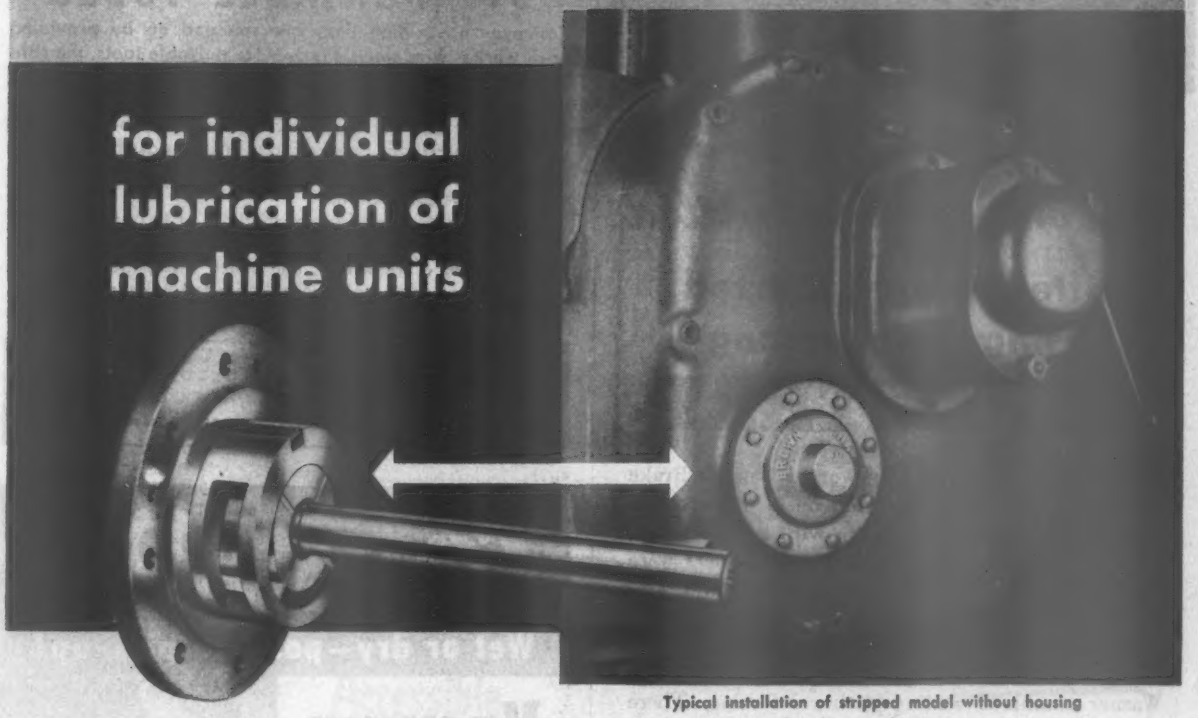
Dependable **DOLGE**
WESTPORT, CONNECTICUT

COMPACT AUTOMATIC REVERSING VANE PUMPS...

for individual lubrication of machine units



Typical installation of stripped model without housing in modern metal-working machine.

You get modern appearance when you equip machines with stripped models of Brown & Sharpe Automatic Reversing Vane Pumps. They're extremely compact . . . yet sturdily built for continuous, trouble-free service.

Brown & Sharpe *Stripped Models with housings* (Nos. 8022, 8062, and 8102) are very easily installed, particularly where internal discharge and suction ports are not readily incorporated in the machine design or when outside piping is desirable. *Stripped Models without housing* (Nos. 8023, 8063 and 8103) wherever installed, offer minimum projection from machine surfaces. Designed for use as integral parts of machines where suction and discharge ports can be incorporated in machine castings.

Fully-automatic reversing with unidirectional flow is a feature of all these pumps. Sizes available: 2½, 5 and 11½ g.p.m. at 0 lbs. pressure and at 1140 rpm. These and other features are fully described in Bulletin. Write Brown & Sharpe Mfg. Co., Providence 1, R. I., U.S.A.

WE URGE BUYING THROUGH THE DISTRIBUTOR

Brown & Sharpe B·S

This picture of Warner's packaging line shows the two cartons used and how they are Tape-Strapped.

Not one package failed

after Warner started using super-strong TAPE-STRAP

Brake assemblies shipped by Warner Electric Brake Manufacturing Co., Beloit, Wisconsin, require cartons of two different sizes, each with a double flap, top and bottom. These corrugated containers were previously sealed with 60-lb. sealing tape, and reinforced with two metal bands. But this protection wasn't enough. Failures were far too frequent.

Then, in one fast operation with Tape-Strap, Warner combined sealing with reinforcing. There hasn't been a package failure in the year since Tape-Strap was adopted, and cost of labor and materials remains about the same.

TAPE-STRAP—Your new packaging tool

Tape-Strap is the unbelievably strong, reinforcing and sealing strip that increases package strength and, in many instances, cuts packaging costs as much as 50%. You get tremendous reinforcing strength in Tape-Strap's "sandwich" construction. Tough textile fibers, thousands to the inch, run lengthwise between two layers of strong Kraft. Tensile strength is 180 pounds per inch of width. Tape-Strap is gummed for instant, permanent adhesion. But, unlike ordinary sealing tape, short reinforcing strips are all you need for most applications.

Write for free sample roll, and complete data.

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BRANCH OFFICES: New York • Philadelphia • Cleveland
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—*for* PORTABLE TOOLS

Conveyor production lines are speeded up by providing each worker with electric power for portable tools, the safe efficient Feedrail way. No wires on the floor—all connections come from an overhead mobile trolley operating in an enclosed bus bar system. Every tool may be protected with fuses or circuit breakers and it is impossible to make connections the wrong way. Ever-Lok connectors prevent accidental disconnection.

Tools may be moved along the line, or to another line in a jiffy, or the whole system may be removed to another building over a week end. For bench work, the tools may be suspended from balancers. Write for Bulletin. 40-A

"A FEEDRAIL INSTALLATION NEVER BECOMES OBSOLETE"

ELECTRIC FEEDRAIL
FEEDRAIL CORPORATION
Subsidiary of Russell & Stoll Company, Inc.
125 BARCLAY STREET • NEW YORK 7, N. Y.

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Wet or dry—positive pick-up!

Vacuum Cleaner

For over 30 years, Tornado has been used in hundreds of industrial plants, hotels, restaurants, hospitals, schools and other institutions. Tornado saves time, cuts maintenance costs, can be operated by inexperienced personnel. Sturdy, lightweight, gives years of trouble-free service. Quickly adaptable to any cleaning chore. Free demonstration—write for name of nearest representative.

FREE! Bulletin 600-F

BREUER ELECTRIC MFG. CO
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This man...

IS YO

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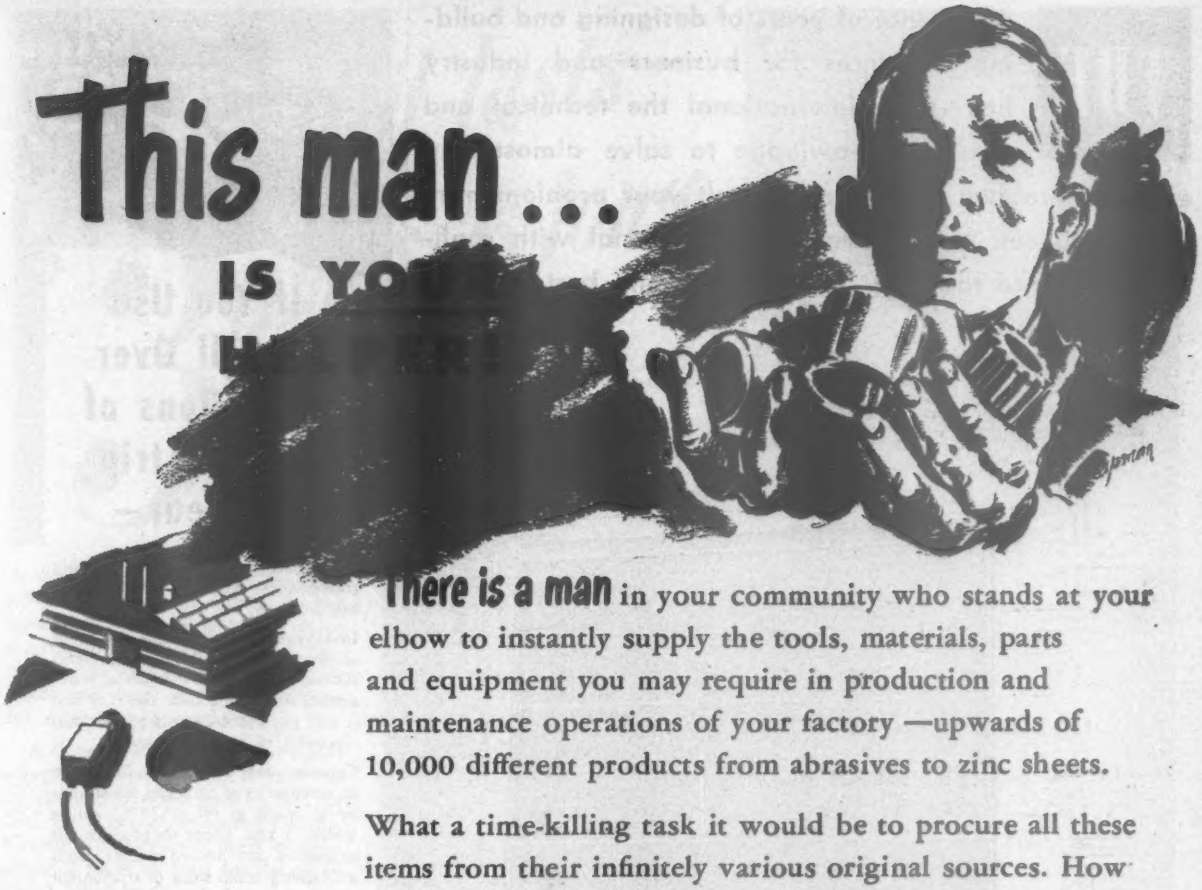

There is a man in your community who stands at your elbow to instantly supply the tools, materials, parts and equipment you may require in production and maintenance operations of your factory —upwards of 10,000 different products from abrasives to zinc sheets.

What a time-killing task it would be to procure all these items from their infinitely various original sources. How economical and convenient it is simply to phone this man, tell him what you want and know that, often within a matter of minutes, it will be in your receiving department.

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"This man" is an industrial distributor* or a specialist in certain industrial items. You will find him listed in the classified section of your telephone book-most likely under the heading Bars, bronze or Bearings, bronze. If he is the leading distributor, he almost certainly is the Bunting Distributor. He carries in stock for your money saving convenience Bunting Standard Stock Industrial Bearings, Electric Motor Bearings, and Precision Bronze Bars—ask him for catalog.

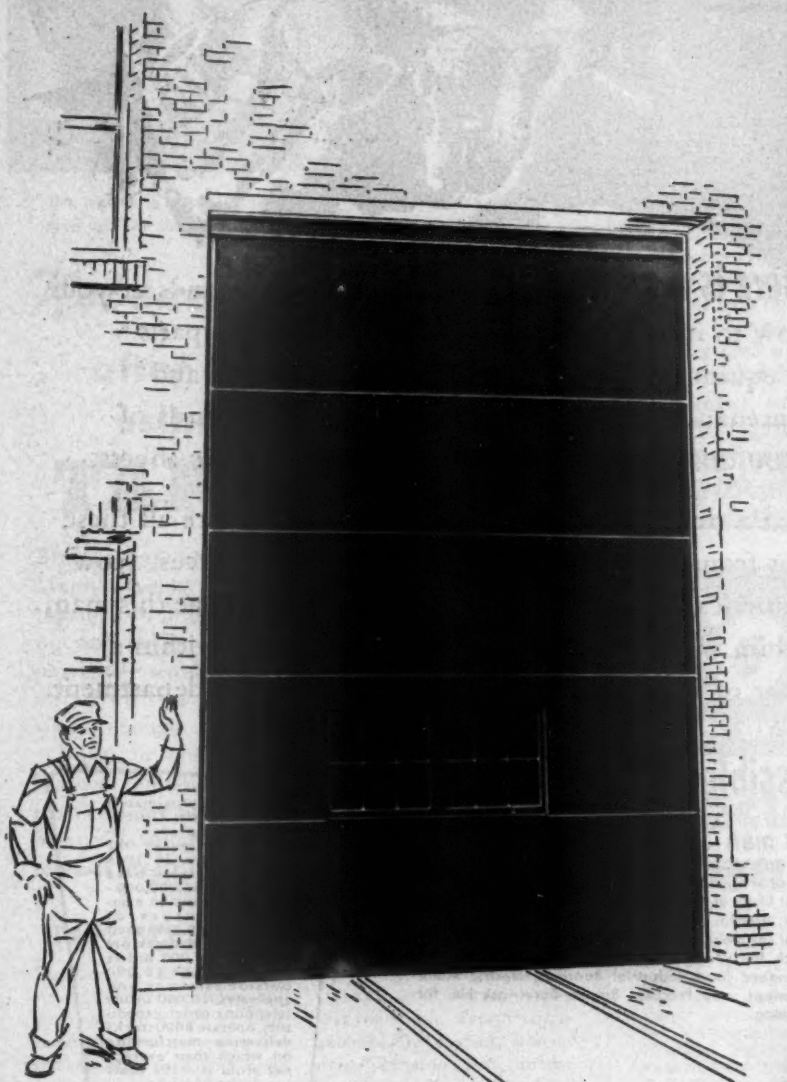
* There are approximately 2000 Industrial Distributors serving every industrial section of the United States. In 1948 their total sales were more than $3,000,000,000. They carry an average inventory of $500,000,000, turn their stocks 5 to 6 times per year, fill 200,000 orders per day, have 12,000 outside salesmen and engineers, 10,000 inside telephone order expeditors, operate 8000 trucks delivering merchandise on which their average net profit is .0292 cents per dollar of sales.

Bunting®

BRONZE BEARINGS • BUSHINGS • PRECISION BRONZE BARS

THE BUNTING BRASS & BRONZE CO., TOLEDO 9, OHIO

THE experience of years of designing and building entrances for business and industry has given International the technical and practical knowledge to solve almost any entrance problem. However difficult your problem may be, you can turn it over to International with confidence that you will get the one best answer.



The door illustrated is a heavy, 5-section, power-driven vertical lift door—built heavy enough for roughest usage . . . constructed for complete weathering and service.

for complete information, write

INTERNATIONAL STEEL COMPANY

1851 EDGAR ST. • EVANSVILLE 7, INDIANA

If You Use or Sell Over 1000 Tons of Coiled Strip per Year—

doing your own slitting may be a big convenience, and very likely also a big economy.

Investigate! First determine how much of your present strip cost represents slitting cost, and how much a Yoder slitting line would cost. You may find it will pay for itself in a year or two—possibly in much less time.

Consider other advantages: Reduction in inventories of coils and slit strands by as much as 60 to 70%; ability within a few hours to produce slit strands of any desired widths, from a relatively small stock of convenient coil sizes; production planning made simpler, easier; no long waits for deliveries; greater accuracy; no damaged edges; reduced freight and hauling cost; less bookkeeping.

Yoder slitters often pay for themselves operating only three or four days per month.

Send for 76-page illustrated book, containing time studies of slitter operation, production, cost, and other practical information.

THE YODER COMPANY

5513 Walworth Avenue, Cleveland 2, Ohio

COLD FORMING

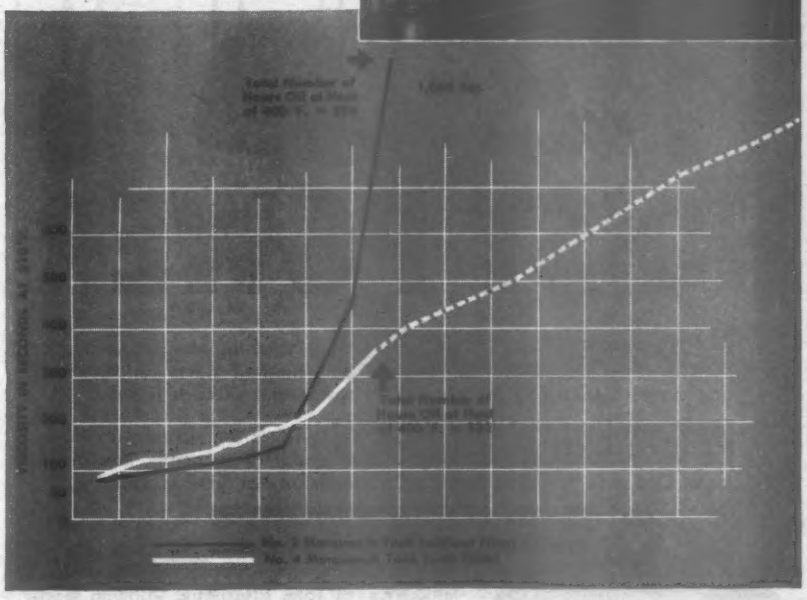
YODER

SLITTING AND

TUBE MILL MACHINERY

Quench Oil lasts 3 times as long

View at International shows white hot gears on loverator ready for mass Marquenching.



At the Ft. Wayne Works of the International Harvester Company the quenching oil used in No. 2 Marquench tank jumped to 1065 Sec. viscosity in 294 hours (see chart at right) and was no longer suitable for quenching operations.

A Honan-Crane Oil Purifier operating a similar tank No. 4 kept the oil clean and down to 345 Sec. at 532 hours. In fact, when the Honan-Crane Oil Purifier is used it takes about 3 times as long for the oil to reach 1000 Sec.

This means the oil can be safely used 3 times as long when a Honan-Crane Oil Purifier is used. A remarkable saving since each of these tanks holds 1600 gallons of oil.

Actual case histories at International Harvester, Salisbury Axle, Borg Warner, Cleveland Graphite Bronze, etc., show that Honan-Crane Oil Purifiers, by keeping quench oils free from dirt, products of oxidation, etc., also give these advantages . . .

1. Extended oil life
2. Quenched parts easier to clean
3. Less oil use . . . less waste
4. Cleaner cooling coils and piping
5. Reduced manual cleaning of tanks and other equipment

also . . . Honan-Crane Filters and Clarifiers for oils and coolants used in metal working operations. Removal of dirt, chips, etc.:

1. Cuts down maintenance on machines
2. Reduces cost of oils and coolants
3. Cuts down rejects
4. Lengthens tool and wheel life

also . . . Honan-Crane Oil Purifiers for keeping hydraulic oils clean. Complete removal of dirt particles and products of oxidation will:

1. Prevent excessive wear of pump parts
2. Prevent clogging of control valves, pistons, etc.
3. Reduce downtime and expensive repairs on hydraulic equipment
4. Extend oil life indefinitely

Write for actual case histories and engineering bulletins on the filtering of hydraulic oils, quenching oils and the clarification of metal working oils and coolants.

HONAN-CRANE CORP. 325 Superior Ave., Lebanon, Indiana

Subsidiary of **HOUDAILLE-HERSHEY CORPORATION**

CM METEOR

● Heavy duty electric hoist for stationary, plain, geared or motor driven trolley suspension. Single and two speed models. Capacities: ½ to 5 tons.

Here's Plant Improvement that

Pays off in 3 Ways

HOIST POWER

LOWERS HANDLING COSTS Picks up raw materials, or finished parts for assembly and moves them along for pennies in power and seconds in time.

ACCELERATES PRODUCTION Takes the slowing up "lags" out of assembly line movement. One man precision "spotting". Speeds up handling in shipping.

IMPROVES PLANT MORALE Saves the backs and muscles of men so that they may produce with "morning" efficiency in late afternoon. Aids in accident control.

Frankly, we don't know how many factories have cut costs by putting CM Electric Hoists on production jobs, but we *do know* they keep coming back for more and more Meteors and Comets. You couldn't ask for more convincing evidence of a product's usefulness to industry than a constantly growing demand.

CM Meteor and Comet advantages are fully described in the complete CM Catalog. Write us for a copy and the name of your local distributor.

CM COMET High speed, sturdy, portable electric hoist. One hand control. Plug in on single or 3 phase power line. Capacities: ⅛ to 1 ton.

CHISHOLM-MOORE

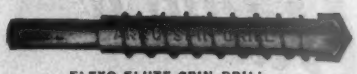
HOIST CORPORATION

Affiliated with Columbus McKinnon Chain Corporation

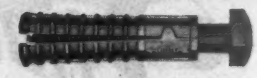
GENERAL OFFICES AND FACTORIES: TONAWANDA, N. Y.

SALES OFFICES New York, Chicago and Cleveland • Distributors Everywhere

TRADE **ARRO** MARK



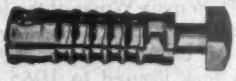
FLEXO-FLUTE SPIN DRILL



LAG SCREW EXPANSION SHIELD

DOUBLE EXPANSION SHIELD

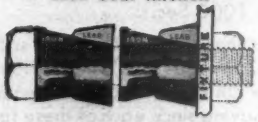
A. C. E. MACHINE BOLT EXPANSION SHIELD



O-E MACHINE BOLT EXPANSION SHIELD

MACHINE SCREW EXPANSION ANCHORS

STUD BOLT ANCHOR



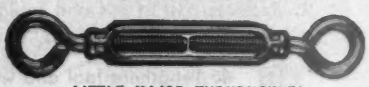
MAL-LEAD BOLT ANCHORS

LEAD SCREW ANCHORS

WING TYPE TOGGLE BOLT

SPRING HEAD STEEL TOGGLE BOLTS

ARRO STAR DRILL

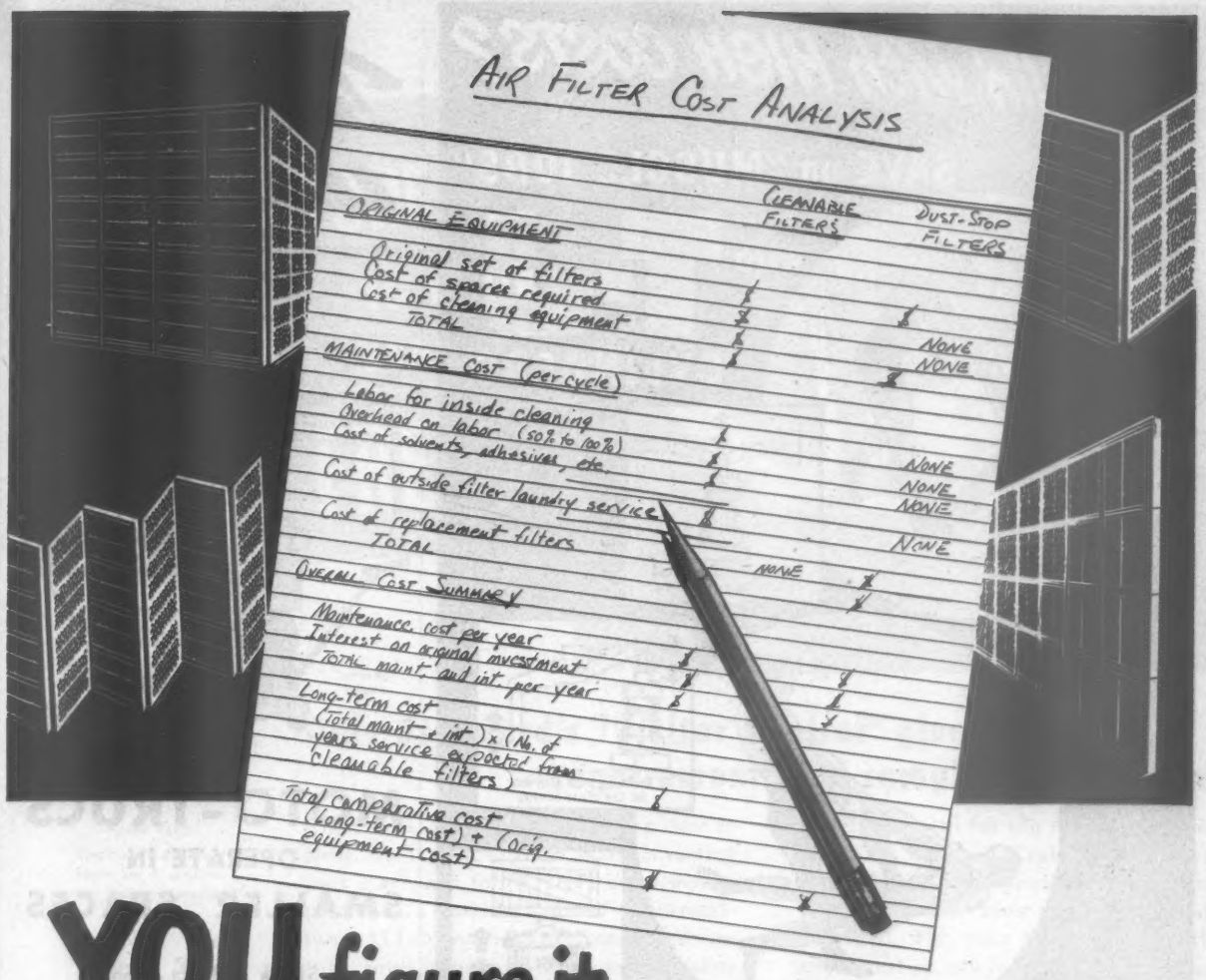


LITTLE MAJOR TURNBUCKLES

— SEE YOUR JOBBER —

ARRO EXPANSION BOLT CO.

1420 BOONE AVE., MARION, OHIO



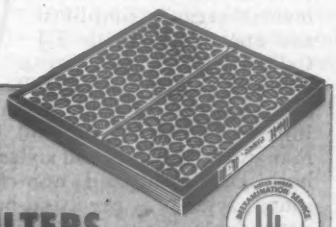
YOU figure it... (4 TO 1, WE'LL SAVE YOU MONEY)

Do you really know which costs you less—cleanable air filters or Dust-Stop replacement-type filters? It's easy to figure out, using the method shown above and *your own cost figures.* Chances are about 4 to 1 that you'll save with new Fiberglas Dust-Stop* Air Filters.

You see, while rising labor costs have made filter cleaning more expensive, mass production has lowered the cost of Dust-Stop Filters. In fact, on the basis of one 40c cleaning every 90 days, cleanable filters would have to last up to 14 years to match the cost of Dust-Stop Filters replaced at the same intervals.

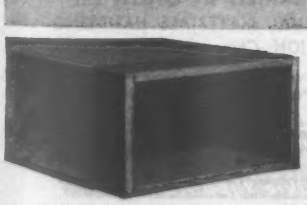
Owens-Corning Fiberglas Corporation, Dept. 85-C, Toledo 1, Ohio.

The "Comparative Study of Air Filtering Costs" contains facts, figures, and charts important to anyone interested in air conditioning. A copy free on request. Write today.



OWENS-CORNING FIBERGLAS **DUST STOP*** AIR FILTERS

*T. M. REG. U. S. PAT. OFF.



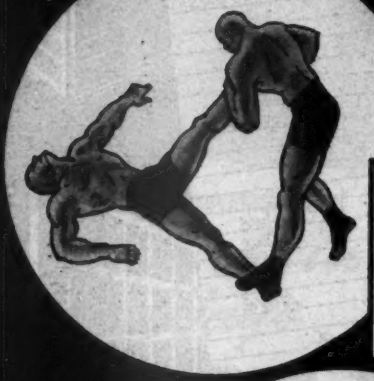
FIBERGLAS INSULATION FOR AIR DUCTS

Ageless, light in weight, firesafe, moisture resistant, Fiberglas Duct Insulations can be easily applied . . . have very high acoustical value . . . won't erode at 6,000 fpm . . . cost less than other insulations approaching them in thermal efficiency. Write for details.

*DUST-STOP is the trade-mark of Owens-Corning Fiberglas Corporation for impingement-type air filters made of glass fibers. FIBERGLAS is the trade-mark (Reg. U. S. Pat. Off.) of Owens-Corning Fiberglas Corporation for a variety of products made of or with fibers of glass.

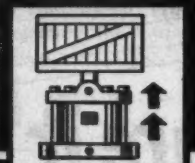
Rasslin' with HIGH COSTS?

SAVE on "MUSCLE JOBS" with T-J CYLINDERS



Toggle—a typical pushing operation.

Pulling—as shown in 1st class lever.



Lifting—a straight thrust movement.

Air or hydraulic power—applied by T-J Cylinders—gets an amazing lot of tough jobs done for industry... *faster, more efficiently,* and *at lower cost!* Check your plant operations and machines *now*—make a note of mechanical movements that can be simplified and speeded up with T-J Cylinders! Designed for a wide range of pushing, pulling, lifting, clamping or control jobs... 100 lb. or 50,000 lb. Many standard sizes and styles... both cushioned and non-cushioned types... precision-built, dependable. Write for additional information. The Tomkins-Johnson Co., Jackson, Mich.

35 YEARS EXPERIENCE T-J

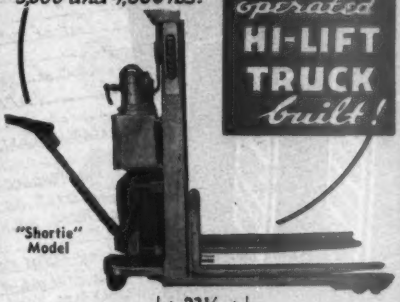
TOMKINS-JOHNSON

RIVETERS · AIR AND HYDRAULIC CYLINDERS · CUTTERS · CLINCHERS

The MOST useful truck

MOTO-TELESCOPIC HI-LIFT WALKIE TYPE TRUCK. *Capacity: 3,000 and 4,000 lbs.*

Shortest battery operated HI-LIFT TRUCK *built!*



"Shortie" Model

|←23½→|

MOTO-TRUCS OPERATE IN SMALLER SPACES

•

Stack Pallets from Narrower Aisles

Moto-Trucs are the shortest trucks of their type built, due to most compact power unit, permitting operation in narrower aisles.

EASIEST CONTROL Minimizes Operator Fatigue

Only Moto-Truc has the easy grip roller type control handle, giving two speeds forward and two speeds reverse by a turn of the wrist. Push buttons in the ends of handle operate the hydraulic lift.

OTHER ADVANTAGES

12-volt motors for level operation, 18-volt for ramp duty.

Four-point mounting under load, ensures stability.

Patented articulating hinged spring unit holds drive wheel down on floor.

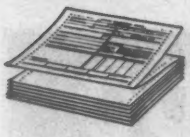
Brake, mounted on drive wheel, relieves strain on gears and chain, ensures safety.

WRITE FOR BULLETIN NO. 51, and Specifications.

SEE EXHIBIT AT BOOTH 201
NATIONAL MATERIALS HANDLING EXPOSITION, *Chicago, Apr. 30 to May 4*

The MOTO-TRUC Co.
1953 E. 59th Street
CLEVELAND 3, OHIO.

Originators and world's largest exclusive manufacturers of motorized, battery operated walkie type trucks

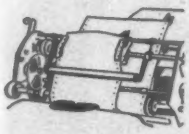


KANT-SLIP
continuous forms

Feeding-aligning devices:
THE REGISTRATOR PLATEN

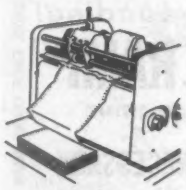
AUTOMATIC LINE FINDER

Advances form into new writing position in one motion



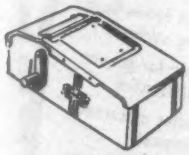
DUAL FEED

Registers 2 *different* forms for 1 continuous typing operation



BURSTER-IMPRINTERS

Sign, date, number, trim, tear off, stack Kant-Slip forms



FORM-FLOW REGISTERS

Better records
. . . by hand

UNIT ZIPSET FORMS

Carbon interleaved

Your Plant IS YOUR STAKE IN FREEDOM

Only Standard's "Visitor Control" gives all 9 requirements for complete protection!

These days, and maybe for a long time to come, you'll want to know WHO is visiting your plant, and for WHAT! For *complete* protection, a Standard Register system establishes ALL these safeguards: centralized control, parcel inspection, time control, visible identification, record of movements, complete information, protection against collusion, specimen of handwriting, and fingerprints.

No other kind of visitor control provides *all 9* of these *vital security requirements!*

There is no need for you to get along with less. The Standard Register system has proved itself in thousands of installations.

Your Standard Visitor Passes will be individualized, with your firm name *plus* the special text of any required security agreement. Write today for special presentation giving complete significance of these 9 minimum requirements and samples of Visitor Passes. Just mail the coupon. No obligation.

It's a Special Feature of "Paperwork Simplification"

See also how Standard Register systems enable you to produce other essential plant records *easier, simpler, faster*—records that provide adequate control by giving all persons complete information at the right time. The coupon will bring the story.

MAIL THIS TODAY!

The Standard Register Company
303 Campbell Street, Dayton 1, Ohio

Please send, without obligation, full information about Standard Visitor Passes, plus the story of "Paperwork Simplification."

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Company_____

City_____ Zone____ State_____

THE STANDARD REGISTER COMPANY
303 Campbell Street, Dayton 1, Ohio
Associated Companies: Sunset-McKee Co., Oakland 6, California. R. L. Crain Limited, Ottawa, Ont. W. H. Smith & Son, Ltd., London, England.

This Special Pittsburgh Brush*

CLEANS RED-HOT CASTINGS in 30 seconds

* *An actual case history from the U. S. Pipe and Foundry Company, Birmingham, Alabama*

A PITTSBURGH brush provides the answer for U. S. Pipe and Foundry's problem of cleaning red-hot castings. This rugged brush works 40 hours a week, turning out thoroughly cleaned castings at the rate of one every 30 seconds . . . a speed record for any brush cleaning operation of this type.

LET PITTSBURGH ENGINEERS SOLVE YOUR BRUSH PROBLEMS

Pittsburgh's complete line of brushes of every type, for every purpose, will provide a practical, economical solution of any brush problem you might have. Drop us a line on your company letterhead for a copy of our new booklet that shows, through actual case histories, how Pittsburgh can help cut your brushing operation costs. Address: PITTSBURGH PLATE GLASS COMPANY, *Brush Div.*, Dept. M1, 3221 Frederick Ave., Baltimore 29, Md.

PITTSBURGH

PPG *Power Driven* **BRUSHES**

BRUSHES • PAINT • GLASS • PLASTICS

PITTSBURGH PLATE GLASS COMPANY

TORNADO®

portable, electric blower

Now you can get fast, thorough, safe cleaning of motors, machinery, equipment and critical areas. The best and simplest way to remove dirt, dust, lint and oily fuzz.

powerful blast of dry air!

Tornado offers 4 industrial models and 3 special models. Many attachments for unusual cleaning requirements. Free demonstration—representatives in principal cities.

FREE! Bulletin 579

BREUER ELECTRIC MFG. CO

• DEPT. F-3 • 5100 N. RAVENSWOOD AVE. • CHICAGO 40, ILL. •

Efficient Car and Truck Loading!

One Man "BRIDGE RAMP"

(U. S. Pat. No. 2521349)

A NECESSARY Auxiliary to a Fork Lift Truck

★ Rugged all-steel welded construction

★ Riding surface—checkered, non-slip steel plate

★ Self-levelling locking device and floating arm prevents shifting

★ Lift handles recess flush with riding surface

★ Curvature—for greater height differential

★ Shock plates at corners absorb impact

★ Stringers for safety and added rigidity

15,000 lb. CAPACITY

FLARE or RECTANGULAR. Sizes and types to span gaps from 5" to 58". Rise 0" to 7" (+ or —).

WRITE FOR FOLDER AND SURVEY SHEET

ELIZABETH IRON WORKS, Inc.

Materials Handling Specialists, Steel Fabricators SINCE 1907

514 Green Lane, Elizabeth, N. J.

CURTIS

The Curtis "Industrialist" offers a new approach for lighting industrial areas by providing both direct and indirect illumination. The direct component provides high levels of illumination on work surfaces, while the indirect component reduces severe contrast between the luminaire and ceiling eliminating dark tunnels prevalent in many industrial lighting installations. Translucent side panels and center steel V-bar reflector conceal a crosswise view of lamps within 25° of the horizontal. The "Industrialist" features high levels of vertical and horizontal illumination, low installation and operating costs, ease of maintenance, instant starting lamps, more lumens per foot of lamp and 96 inches of uninterrupted light. Write today for complete technical data.

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COMPANY_____

ADDRESS_____

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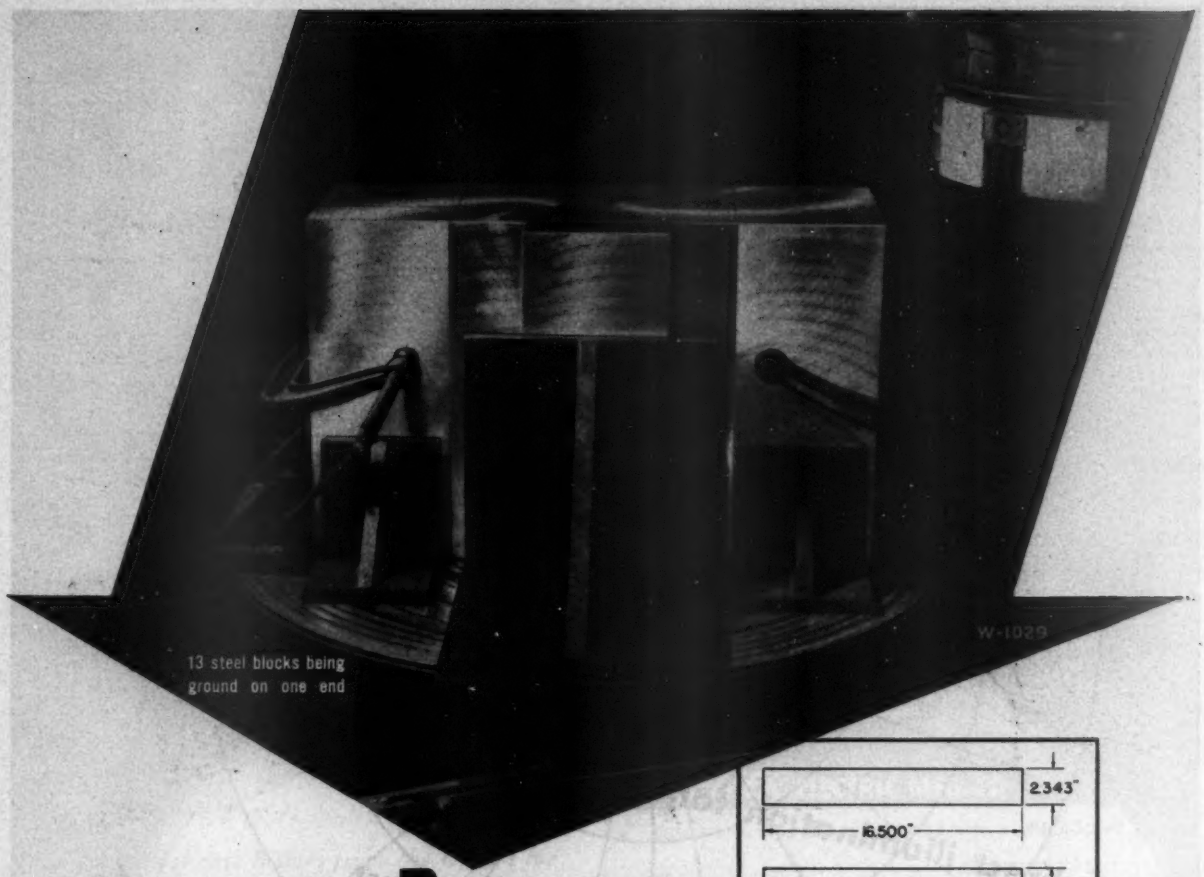
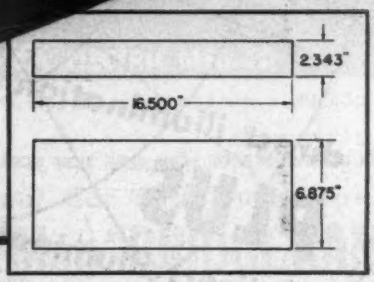
LIGHTING, INC.
6135 WEST 65th STREET CHICAGO 38, ILLINOIS





Put it on the BLANCHARD

√. . . for stock removal

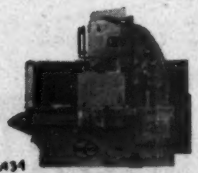
These annealed steel blocks were ground on all 6 surfaces on a Blanchard No. 18 Surface Grinder. Rough size was 16¾" x 7⅛" x 2½". *37.439 lbs. of metal were removed from each piece!*

√. . . for speed

Thirty of these steel blocks were ground on all 6 surfaces in 42½ hours. *This is a floor-to-floor time of only 85 minutes each.* All surfaces were ground square within .002", and flat and parallel.

√. . . for comparison

Let Blanchard grind some sample parts, or give you estimates from prints of your surface machining jobs. A comparison with your present methods may surprise you!



NO. 18 BLANCHARD SURFACE GRINDER

V-434

Send for your free copies of "Work Done on the Blanchard," fourth edition, and "Art of Blanchard Surface Grinding."

PUT IT ON THE BLANCHARD

THE BLANCHARD MACHINE COMPANY **64 STATE ST., CAMBRIDGE 39, MASS., U.S.A.**

PERFORMANCE PERFECTION?

there's proof in production with . . .

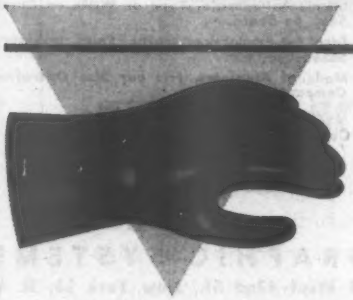
HOOD Gloves!

Model 4703 – Full Neoprene coated, knit wrist style used in all types of general industry. Liquid proof, curved fingers, no seams on working surface.

Model 7701 – Fully Neoprene coated with (4") cuff for use where dipping operations, spray or splash are not too high.

Yes, employee's hands in Hood Industrial Work gloves are sure of two very important benefits – ease of handling and protection. And both these vital benefits have been proven before the gloves leave the factory by Hood's famous "on the job" testing in many industries.

Shown here are just two of the many models available for your employees whatever your business may be . . . models that reflect the enviable reputation that Hood has built in more than 50 years. Investigate the advantages of Hood gloves today and you will soon see why experienced personnel in *all* industries "put on a pair of Hood gloves" when they want more efficiency, longer wear, extra comfort, important economy and more protection.



"Put your employee's hands into a safer glove"

Write today for the colorful new catalog showing the entire Hood line.

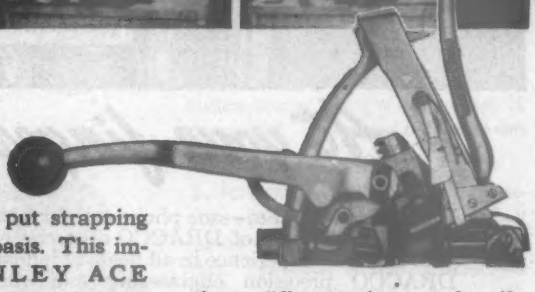
HOOD for NEW Safety PLUS

HOOD RUBBER CO. Watertown, Mass.

4 STEPS 5 SECONDS

with the Improved

STANLEY ACE STRAPPING TOOL



● Here's how to put strapping on a production basis. This improved STANLEY ACE STRAPPING TOOL is light — fast — simple — even a beginner can make time with it. Magazine hold 100 seals — is easily loaded and seals in any position. The "Ace" is made in three different sizes, to handle ⅜", ½" and ⅝" strapping. Put the "Ace" to work for you! The Stanley Works, Steel Strapping Div., 201 Lake St., New Britain, Conn. Offices in principal cities.

STANLEY

Reg. U. S. Pat. Off.

HARDWARE • TOOLS
ELECTRIC TOOLS
STEEL STRAPPING • STEEL

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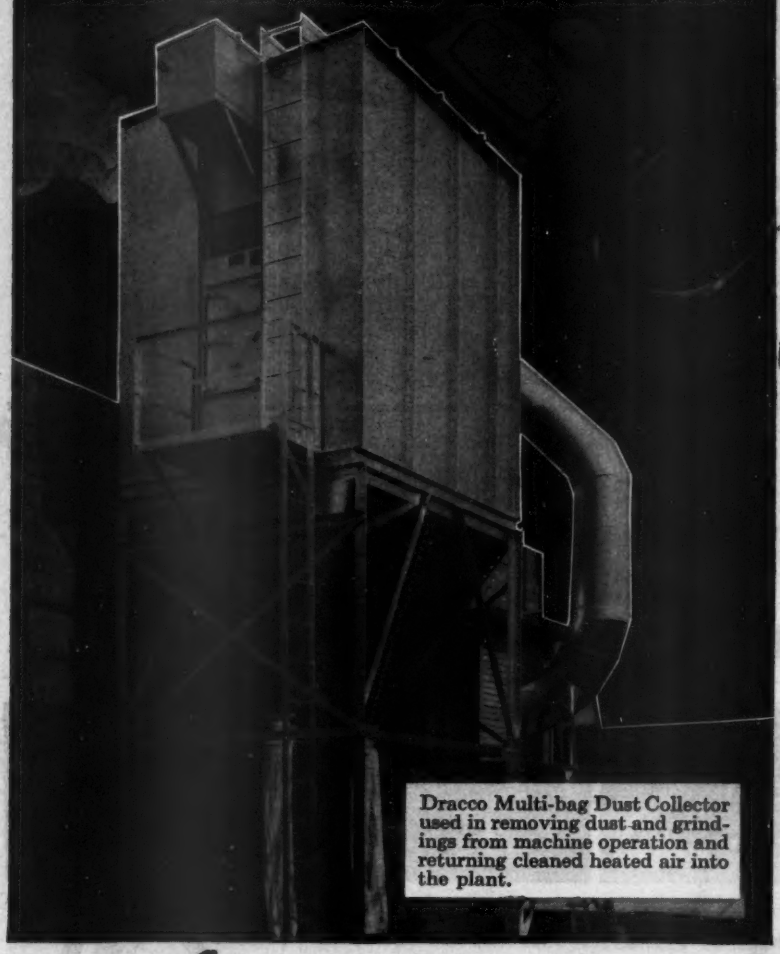
The Stanley Works, *Steel Strapping Division*
201 Lake Street, New Britain, Conn.

Gentlemen: Please send me free folder on the improved ACE Strapping Tool.

Name .....
Title .....
Company .....
Address .....
City ..... State .....

DRACCO
DUST CONTROL EFFICIENCY



Dracco Multi-bag Dust Collector used in removing dust and grindings from machine operation and returning cleaned heated air into the plant.

At your fingertips!

It's as simple as that—one phone call (or letter if you prefer) will place 35 years of DRACCO dust control experience at your service—experience in all fields of industrial production. DRACCO precision engineering and construction have produced increased manufacturing efficiency in thousands of industrial applications—each designed for the specific requirement of the installation.

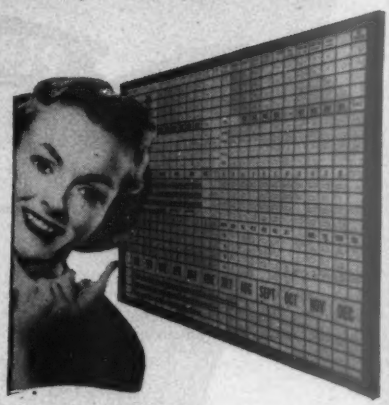
DRACCO engineers will gladly analyze your dust control or recovery problems and submit recommendations for equipment that will produce top efficiency in your manufacturing operations. Just call or write DRACCO CORPORATION, 4063 E. 116th St., Cleveland 5, Ohio or 415 Lexington Ave., New York 17, N. Y.

AGENTS IN PRINCIPAL CITIES

DRACCO DUST CONTROL EQUIPMENT

PNEUMATIC CONVEYORS • METAL FABRICATION

IDEAL VISUAL CONTROL



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★ Simple to Operate. Type or Write on Cards, Snap on Board.

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★ Made of Aluminum, Fits any Size Operation. Compact, Attractive.

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425 Series—extra long —even LONGER LASTING!

465 Series — mammoth size for grading logs.

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the AMERICAN CRAYON company Sandusky, Ohio

When you pay for your reputation . . .

Hoover®
ELECTRIC MOTORS

guard your good name

When you buy any kind of production equipment, your reputation with the "boss" may hang on that equipment's performance.

Not only that, in times like these your company's reputation may depend on production equipment that stays on the job, performs reliably, and keeps production humming. This is why so many plant managers and purchasing agents specify Hoover Motors as original equipment or replacements.

Hoover general-purpose motors are famous for long, quiet, dependable service. They're built like motors costing far, far more. And they come in three basic types to fit your requirements, whatever they are:

1. SPLIT-PHASE MOTORS for easy-starting, quick-to-accelerate applications such as fans, blowers, office equipment, light machine tools. High overload capacities. Sleeve or ball bearings, ¼ and ⅓ HP. Rigid or resilient mounted.

2. CAPACITOR-START MOTORS for hard-starting, continuous-duty applications such as compressors, machine tools, and pumps. Rigid or resilient mounted, sleeve or ball bearings, ¼ through 1 HP. Rigid-mounted ball bearing only through 3 HP.

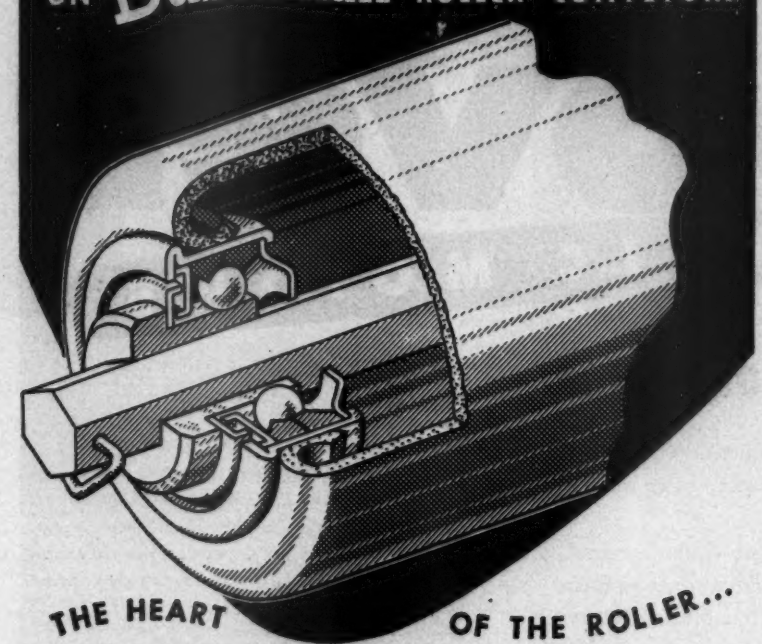
3. POLYPHASE MOTORS for use where three-phase supply lines are available. Start without reduced voltage compensator. Low-cost operation. Rigid mount or resilient mount, ball bearings, or sleeve bearings, ¼ through 1 HP. Rigid-mounted ball bearing only through 5 HP.

Besides these general-purpose motors, there are other Hoover Motors designed especially for pumps, oil burners, fans and blowers. Write for details. Let Hoover Motors help your company's reputation . . . and your own!

THE HOOVER COMPANY
Kingston-Conley Division
68 Brook Avenue
North Plainfield, New Jersey

Let 'er Roll...

ON Buschman ROLLER CONVEYORS



THE HEART OF THE ROLLER...

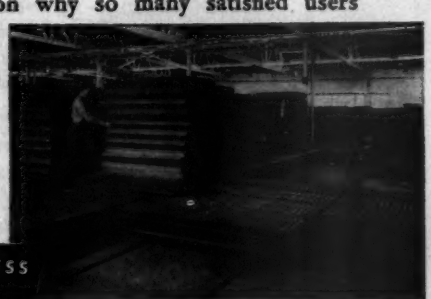
LUBRICATED FOR LIFE

The completeness of the BUSCHMAN Roller Conveyor Line fulfills all plant operating conditions regardless of whether they be the exception or the commonplace.

BUSCHMAN Roller Conveyors with labyrinth seal, dust proof, lubricated for life bearings (illustrated above) are unexcelled in performance under abnormal conditions. Where extreme service requirements are encountered . . . severe temperatures or abundance of grit, Alemite fittings can be supplied.

BUSCHMAN Roller Conveyors with non-lubricated commercial type bearings, however, are all that is required in the majority of instances.

Investigate the reason why so many satisfied users specify BUSCHMAN—they're *BETTER BUILT** and a *BETTER BUY.*



Roller Conveyor installation ➡ at noted corrugated paper manufacturing plant.

* Rollers turned in on ends, bored for full bearing seat.

PRODUCE MORE . . . FOR LESS on Buschman Conveyors

THE E. W. BUSCHMAN CO., INC.
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FIRE-SAFE
Exterior or Interior
WALLS...

...Erected Fast and Built to Last with
KAYLO LAMINATED PANELS

Here's the modern way to build better curtain walls or interior partitions, *and* with an available material —Kaylo Laminated Panels. In one operation, 32 square feet of strong, insulating, fire-safe wall goes into place.

Kaylo Laminated Panels have a core of calcium silicate (not glass)—a remarkable chemical compound which is completely inorganic and incombustible. The Kaylo core is securely bonded to facings of cement-asbestos with a waterproof adhesive. Installed with proper joint systems, the Kaylo Laminated Panels meet ASTM one-hour fire standards.

Although Kaylo Laminated Panels are lightweight (only 6¼ pounds per square foot), they have exceptional strength, dimensional stability and resistance to impact. They are rotproof, vermin-proof and resist water damage. Kaylo Laminated Panels are only 2 inches thick yet they give better heat insulating value than 16 inches of solid concrete.

Kaylo Laminated Panels may be attached to either steel or wood framing. They can be sawed, nailed or drilled with standard tools. Kaylo Laminated Panels provide better walls, reduced building load, increased floor space and easier erection for nearly every type of building.

WEIGHT AND INSULATING VALUES COMPARED WITH OTHER WALLS

	U-FACTOR (Btu./sq.ft/hr/°F.)	WEIGHT (lb./sq. ft.)
2" KAYLO LAMINATED PANELS WITH CEMENT-ASBESTOS FACING	.30	6¼
8" SOLID BRICK	.50	84
8" HOLLOW CINDER BLOCK	.42	30

See our CATALOG in Sweet's

For complete details on Kaylo Insulating Roof Tile, write Dept. N-201, Owens-Illinois Glass Company, Kaylo Division, Toledo 1, Ohio.

KAYLO® ...first in calcium silicate

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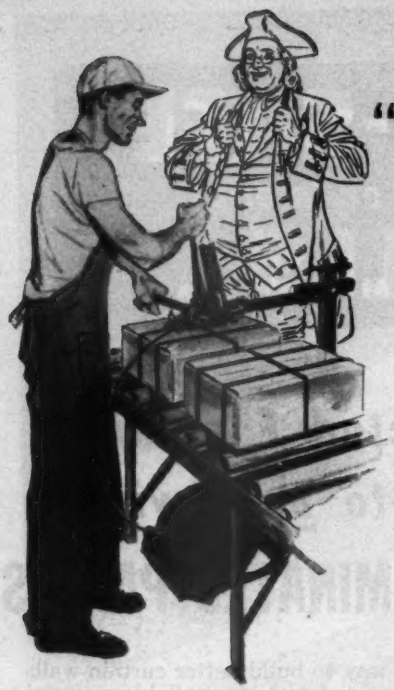

"The eye of the master will do more work than both his hands."

—Ben Franklin's Almanac, 1757

Touring thy plant with a critical eye can do more for the health of thy business than a trip to Washington.

—Acme Steel Notebook, 1951

Your management eye needs to be a dozen places at once these days—on supplies, on production, on deliveries, and all over your plant to keep efficiency high and morale up.

Your Acme Steel representative is ready to help bring you greater thrift in the use of Acme Steel's flat steel strapping and stitching wire in your packaging, shipping, and materials handling operations. He may be able to suggest more efficient ways to use Acme Steel products and accessories to improve your use of the available supply.

In spite of an increase in productive capacity, U. S. military requirements for some products make it impossible for Acme Steel to meet all the demands of the 50,000 customers, representing nearly every American industry, in these rearming times. But Acme Steel tries to help in every way we can—we always have for more than 70 years.

Information for ready reference on Acme Steel products is available upon request.

ACME STEEL COMPANY
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To contact the nearest of our 46 Service Offices in the United States and Canada, check your telephone directory, or write us.

5 things you can do to keep your Acme Steel Strapping Tools on the job:

1. Clean and oil every week.
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5. Ask us about the Acme Steel "3-WAY SERVICE PLAN" for equipment repairs.

ACME STEEL CO. CHICAGO

ACME STEEL

Acme Steel Company has enjoyed sound, steady growth under the American business system of open competition. Since 1901 we have made 286 consecutive dividend payments to our stockholders.

ACME STEELSTRAP flat steel strapping and ACME UNIT-LOAD carload bracing BAND, SEALS and TOOLS • ACME SILVERSTITCHERS and ACME SILVERSTITCH WIRE for box stitching • ACME-MORRISON METAL STITCHERS and BOOK STITCHERS • ACME-CHAMPION BAG STITCHERS • ACME HOT AND COLD ROLLED STRIP STEEL • ACME GALVA-BOND steel slat stock for Venetian blinds • ACME STEEL SPECIALTIES, including hoops, corrugated fasteners, nail-on strapping and other container reinforcements • ACME STEEL ACCESSORIES—snips, cutters, punches, tool mounts, reel stands, coil holders, coil trays.

DRAFT THIS HOIST!

Greater and greater production is the nation's demand upon industry in these troublesome times. To meet the nation's demand while maintaining the lowest possible operating costs is industry's chief concern. There's a way to do both!

Draft the 'Budgit' Electric Hoist and man it with an older man, a woman, or a teen-age boy and solve your lack of strong, young men to lift parts for guns, tanks, airplanes, and other articles you manufacture. A 'Budgit' is easy to operate, lifting action is fast and effortless for the operator. It's a safe hoist — ready to use the moment it's unpacked.

Check your production, assembly, and inspection lines as well as other spots in your plant where production depends upon load lifting. There's where you will need a 'Budgit' Electric Hoist. Many thousands served in thousands of industries in World War II. They're ready — today.

Available for all standard currents in a variety of speeds. Capacities: 250 to 4,000 lbs. Prices start at $119. Write for Bulletin No. 391.

'BUDGIT' CORD REELS keep conductor cords taut, up out of way. Cable reels off in all directions. Prices start at $44.50

MAXWELL MANNING MOORE

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MANNING, MAXWELL & MOORE, INC.
MUSKEGON, MICHIGAN

Builders of 'Shaw-Box' Cranes, 'Budgit' and 'Load Lifter' Hoists and other lifting specialties. Makers of 'Ashcroft' Gauges, 'Hancock' Valves, 'Consolidated' Safety and Relief Valves, 'American' Industrial and 'Microsen' Electrical Instruments.

Selenium-rectifier truck charger for lead-acid or nickel-alkaline batteries. 45-amp charging rate.

Copper-oxide-rectifier truck charger for lead-acid nickel-alkaline batteries. 90-amp charging rate.

Make your electric trucks more productive

Plan now to make your investment in electric trucks pay off all the way. Get time-proved General Electric rectifier-type truck chargers to keep trucks on the job . . . keep charging costs low.

G-E battery chargers can be located right in work areas, can easily be moved from place to place. They permit the recharge of batteries right in the truck. Simply plug in the cable—the charger does the rest.

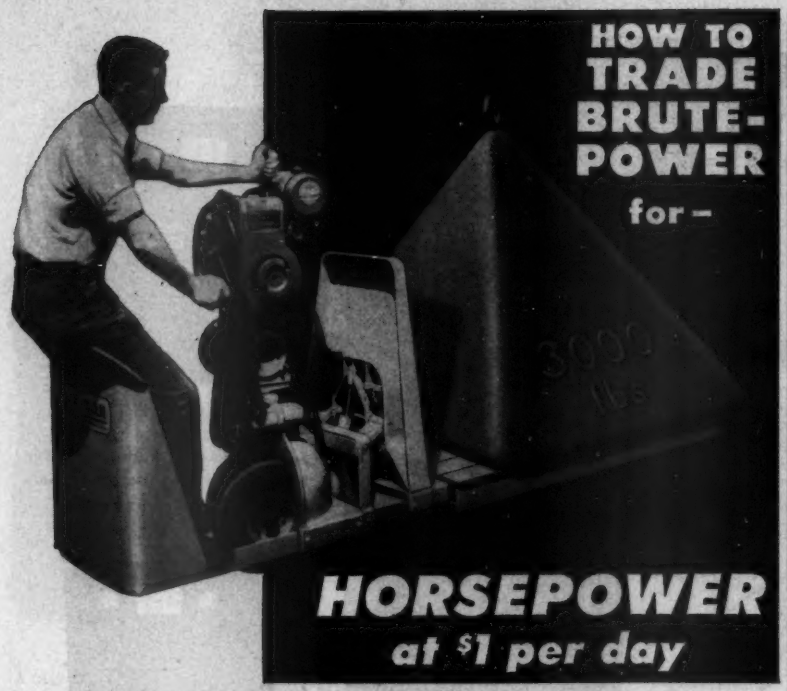
Long-life General Electric selenium and copper-oxide-type chargers require only an occasional dusting for maintenance. There are no moving parts in the selenium charger, and only a small fan in the copper-oxide types. Both rectifier truck chargers operate from either 115 or 230 volts, 60 cycles, single phase.

In the event that your General Electric battery charger ever requires service, there are 29 strategically located G-E service shops ready to repair, recondition or rebuild them at a moment's notice.

See your truck agent for information on these General Electric battery chargers. Or write Section 463-4 for particulars. *Apparatus Dept., General Electric Company, Schenectady 5, N. Y.*

GENERAL ELECTRIC

463-4

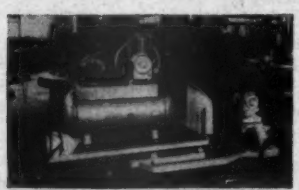


Here's how you can install modern lift-truck handling methods in your plant—and your fuel cost may be less than $1 per 2-shift day. The versatile Truck-Man's rugged gasoline power, hydraulic lift and maneuverability fit it into plants and warehouses of all types and sizes. Here's how Truck-Man can save your money and manpower:

IF YOU'RE SMALL — Truck-Man Skid Lift, Pallet Toter or Platform Utility move loads now handled by two or three men with "push-pull" trucks or hand-led powered "jacks," limited to the pace of the operator.

IF YOU'RE GROWING — The Truck-Man Pallet Toter is economical for picking up distant palletized loads and laying 'em down for your heavier, costlier "stacker." Use Model D if you work with skids.

IF YOU'RE BIG — Plants covering acres use fleets of Truck-Man Pallet Toters as inter-plant "feeders"— increase the efficiency of their big fuel-and-power-consuming stackers by restricting travel to small areas. The Skid Lift easily handles 3500 lb. skid and bin loads, loading directly on trucks and cars.



Model DT Platform Utility—2000 lb. Capacity

Model D Skid Lift—3500 lb. Capacity

TRUCK-MAN GIVES YOU—

• Low cost, easy maintenance, a minimum of fuel and labor • Maneuverability in crowded aisles, 360° steering, 27" width • Simple, sure handling with driver always facing load and his "spot" • Pneumatic-tired drive wheels for fragile loads, wooden floors, reduced driver fatigue • Dash pot throttle controls for soft starting; two speeds forward and reverse; speeds from a creep to 8 mph • Efficient load to weight ratio of almost 4 to 1, easy on elevators, ramps, car and truck floors • Rugged design — built for 'round-the-clock, man-saving work!

NEW POWER
NEW STEERING
NEW TRANSMISSION

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Humphrey
AUTOMATIC
GAS UNIT HEATERS

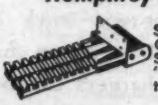
Completely Self Contained . . . Eliminates Boiler Equipment, Fuel Storage, Steam or Water Lines.

Reduce your heating costs with a Humphrey Gas Unit Heater. Get fast, clean heat, effectively circulated by forced air action.

Economical to install with "maintenance-free" operation... the Humphrey is the ultimate in efficiency. Suspended from ceiling, Humphrey Unit Heaters leave entire floor space for productive facilities.

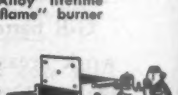
Ideal for factories, offices, warehouses and garages. Write today for illustrated folder.

"Compare These EXCLUSIVE Humphrey Features."



SUPER COMBUSTION CHAMBER — Stainless Steel Alloy lifetime "dual flame" burner tips.

POSITIVE SAFETY CONTROLS — Basoid Safety Pilot shuts off gas in case of pilot outage. Overload control eliminates over heating.



ADJUSTABLE LOUVERS — Horizontal or vertical louvers control angle of heat flow.

FREE FLOW HEAT EXCHANGER — Electrically welded, heavy steel . . . gas tight . . . needs no cleaning . . . no baffles to impede flow.

GENERAL GAS LIGHT CO.
KALAMAZOO, MICHIGAN

With Skilled Workers Short can you afford*

this high unnecessary Loss?

Eye Accidents Cost $160,000,000 in Lost Man-Hours***

In the effort to maintain and increase production, some sections have resorted to community-wide pooling of skilled labor and machine tools . . . a praise-worthy move. But DON'T FORGET THE OPPORTUNITY OFFERED TO PREVENT LOSSES AND BOOST PRODUCTION BY PREVENTING INDUSTRIAL EYE ACCIDENTS AND THEIR HIGH COSTS!

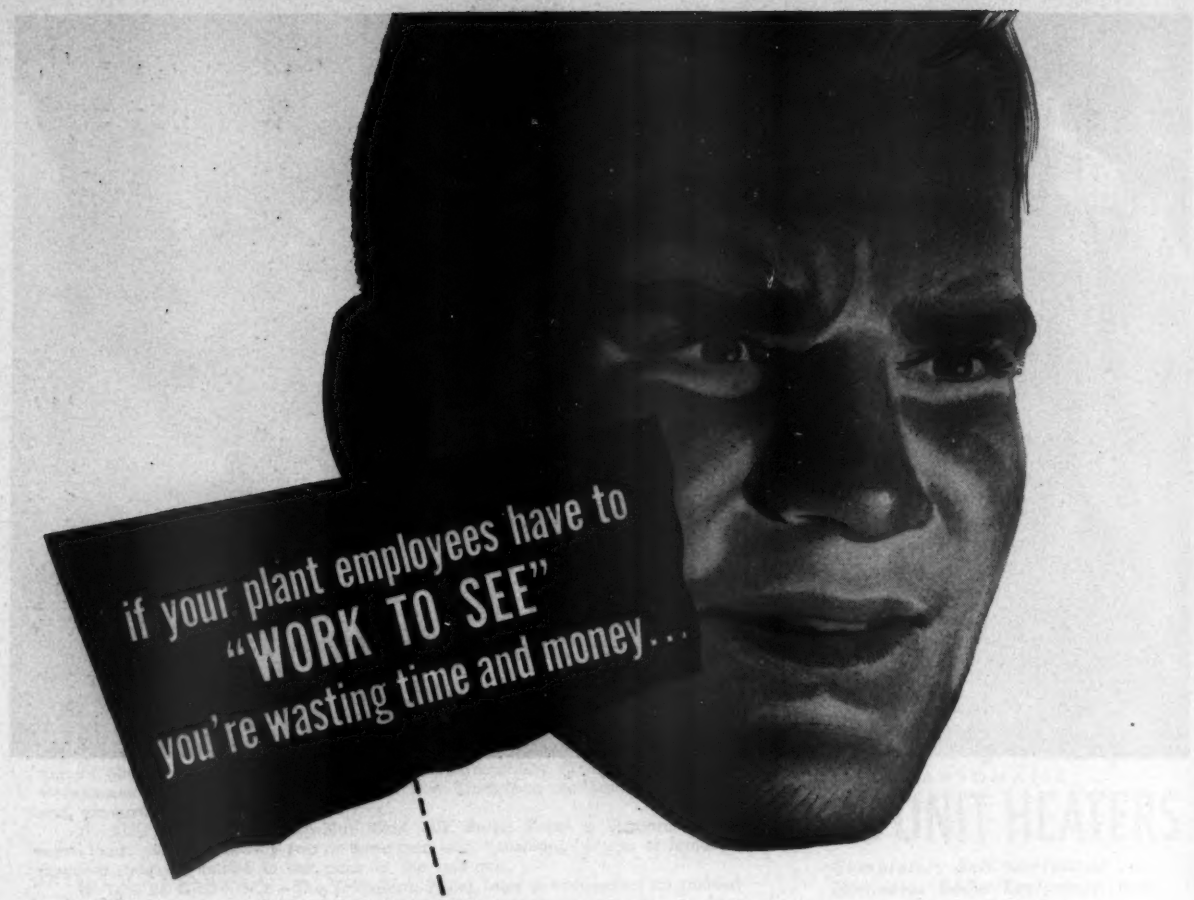
An AO Eye Protection program can prevent 98% of all eye accidents . . . keep valued workers on the job . . . save (as it has for many companies) thousands of dollars annually — AND PAY FOR ITS MODEST COST IN SIX MONTHS TIME OR LESS. Ask your AO Safety Representative for complete facts and figures.

*Bureau of Census reports only 3.7% of the labor force not at work Sept. 1950.

American Optical
SAFETY PRODUCTS DIVISION

***ESTIMATE. Does not include average cost of compensation which even for the low cost year of 1938 was $328.

SOUTHBRIDGE, MASSACHUSETTS • BRANCHES IN PRINCIPAL CITIES



because

easy, effortless vision is the first requisite of a producing worker

Put your plant operations under the stimulating influence of Day-Brite lighting—either "Day-Line" or "Tur-A-Top"—and earn the extra profits that come with higher employee morale and efficiency.

But your pocketbook deserves consideration, too—and gets it with Day-Brite.

Every dollar you put into Day-Brite lighting buys you a *full* dollar's worth of *permanent* quality. The Day-Brite fixtures you install today will perform tomorrow, the next month, for many years to come, in the same efficient, economical way they do the first time you flick the switch.

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NOW MORE THAN EVER
AMERICA MUST SEE WHAT IT'S DOING

IT'S EASY TO SEE WHEN IT'S

118

QUICK SOLUTION to MANPOWER PROBLEMS

through the SEARCHLIGHT SECTION of this publication. The market place for those offering or wanting the services of men on technical and specialized executives, the SEARCHLIGHT SECTION offers a quick, effective solution to your manpower problems. Because its readership is confined to just the type of men you need, waste circulation is avoided—you reach only the men you want.

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Classified Advertising Division

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MOTOROLA FM 2-WAY RADIO

Handles 76 rush calls a day on a single shift at Caterpillar Tractor Co.

Helping to keep the sprawling production lines rolling at this gigantic 128-acre plant is the job of versatile Motorola FM 2-way radio! With the Motorola engineered inter-plant communication system, Caterpillar is maintaining an unbroken stream of materials flowing to the most remote sections of the plant.

MOTOROLA CAN SPEED YOUR PRODUCTION, TOO!

It will pay you to investigate how a specially engineered Motorola FM 2-way radio system can save precious time, labor and money in *your* specific operation. You get *guaranteed peak performance* with Motorola...equipment that will *not* be obsolete tomorrow because it incorporates the "years ahead" engineering developments of Motorola's famed research laboratories. It will pay you to INSIST ON MOTOROLA—the world leader in communication systems for industry!

← **Uni-Channel SENSICON Dispatcher for use as portable base station, mobile dash or trunk mount.**

→ **"HANDIE-TALKIE" Radiophone houses a complete FM transmitter-receiver in a single compact unit.**

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COMMUNICATIONS & ELECTRONICS DIVISION
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COMPLETE INDUSTRIAL RADIO COMMUNICATIONS ... SPECIALISTS IN MOBILE RADIO FOR 22 YEARS

Please send me detailed information on Motorola FM 2-way radio equipment for industrial applications. Dept. FM3

Name_____ Phone_____
Company_____ Position_____
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The RIGHT heat, RIGHT where it's needed . . . with TRANE GAS UNIT HEATERS

Solve gas unit heating problems once and for all with this new Trane Unit Heater. It's simple, it's safe . . . it's ruggedly built for extra years of trouble-free service.

The heart of the unit is the new Trane light-weight heat exchanger that's "built like a boiler." Beaded and flanged tube-to-endsheet construction is rigid, airtight and permanent. No furnace cement needed to hold this unit together! Staggered arrangement of tubes creates wiping effect with heated air for more efficient heat exchange. The unit is designed for easy cleaning without removing the casing.

Easily accessible "burner drawer" innovation saves time, simplifies maintenance. No casings to disassemble, no seals to break to get at the burners on the new Trane Unit . . . the complete burner assembly slides out like a desk drawer.

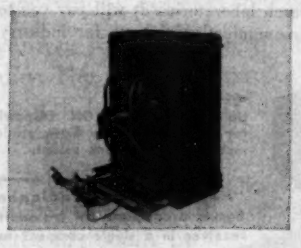
Quiet, efficient Trane Fans are expressly designed for unit heater requirements. Broad, all-steel blades push large quantities of air over the entire heating surface. Built-in draft diverter, one-piece cast iron burners and automatic safety controls. AGA and Underwriters' Laboratories approved. Seven models between 50,000 and 210,000 BTU input.

Famous Trane Louver Fin Diffuser fits all Trane Gas Unit Heaters. A finger-tip adjustment tailors the air stream to just the right heat pattern for each location. Compensates for changes in floor plan, partitions, working area without changes in the unit heater installation. Put the *right* amount of heat *right* where it's needed with Trane Gas Unit Heaters.

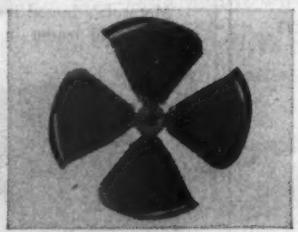
The Trane built-like-a-boiler heat exchanger with beaded and flanged tube-to-endsheet construction.

Typical installation where Trane Gas Unit Heaters provide plenty of warmed air for spot heating requirements.

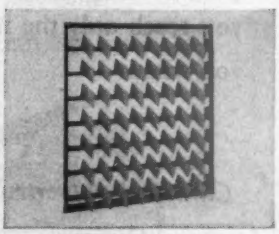
Burner assembly slips out like a drawer—saves time, simplifies maintenance.



All steel, broad bladed Trane Fan is especially designed for unit heaters.



The famous Trane Louver Fin Diffuser. Finger-tip air stream control both vertically and horizontally.



Heating problems of all types are easily solved with units from the complete Trane Unit Heating Line. Gas, steam or hot water . . . BTU's by the thousands or by the millions . . . propeller or blower type—Trane makes them all. For an unbiased recommendation of the right unit, in the right size for any unit heater requirement large or small, contact your nearest Trane field representative.

TRANE

The Trane Company, La Crosse, Wisconsin • Eastern Mfg. Division, Scranton, Pa. • Trane Company of Canada, Ltd., Toronto . . . Unit Heaters, Convectors, Heating and Cooling Coils, Fans, Compressors, Air Conditioners, Unit Ventilators, Special Heat Exchange Equipment, Steam and Hot Water Specialties.

MANUFACTURING ENGINEERS OF HEATING AND AIR CONDITIONING EQUIPMENT • OFFICES IN 80 CITIES

Type H

LEAK DETECTOR

list price $519.00

Operators like the G-E detector, they can sit while working or if necessary can carry the light-weight portable unit to larger jobs.

"FASTEST AND MOST DEPENDABLE method we know of to detect leaks,"

. . . Robertshaw-Fulton Controls Co., Bridgeport Thermostat Division recently told us. They also said their General Electric leak detector—

Saves time "We now find leaks in one fourth the time that the old method took."

Is easy to use "No more bother with the bulky tanks, fixtures, and other special equipment that we formerly used."

Improves product "The G-E detector is our good-will machine. With it, we make a better product that keeps our customers satisfied."

The G-E Type H leak detector will do a fast and accurate job of finding leaks in any pressure system where a halogen tracer can be introduced. It saves time and money while giving you high sensitivity and versatility.

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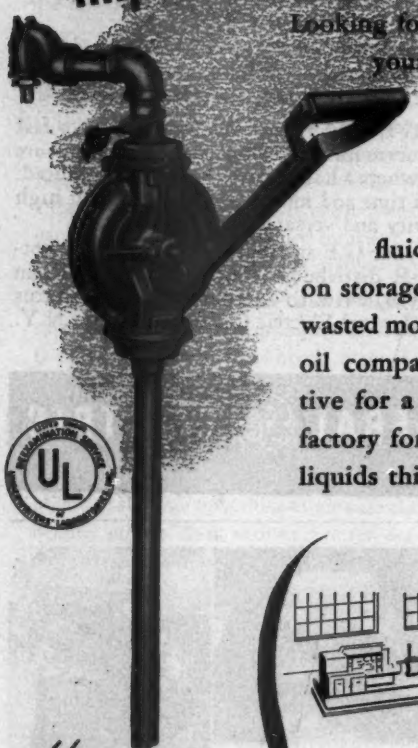

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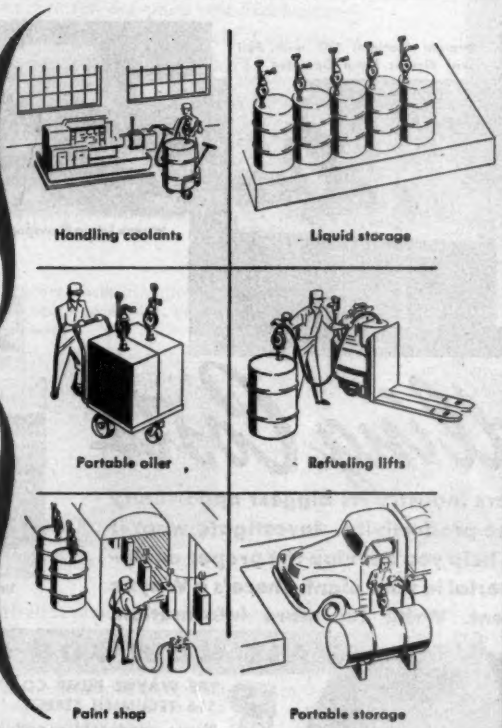

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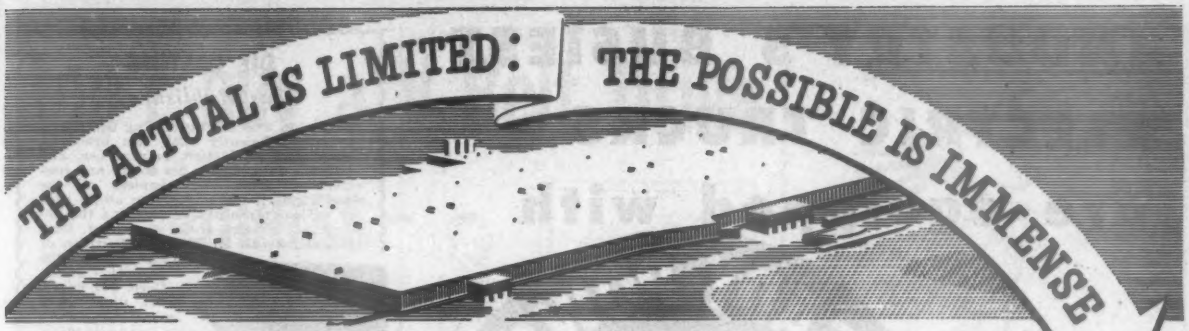

NEW LINCOLN PLANT CREATED BY INCENTIVE-INSPIRED CO-ACTION IN DEVELOPING POSSIBILITIES IN PRODUCT

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Machine frame designed in welded steel maintains alignment to .005"

Textile machine bed fabricated at The Warner and Swasey Company, Cleveland, Ohio, shows cast steel adapter welded to end of frame.

BY redesigning to a simpler, more economical welded steel construction, this prominent machine tool and textile equipment builder now maintains closer production tolerances while cutting the machining time from 8 hours to 2¼ hours. Alignment accuracy, held within .005" and squareness to within .0015" on the 120 inch frame members shown, is maintained with only one roughing and one finishing cut.

Originally the frame was fabricated from sheared plate using continuous corner welds. The present, simplified design incorporates steel tubing and four angles to which steel castings are welded at each end for subsequent assembly on side frame members.

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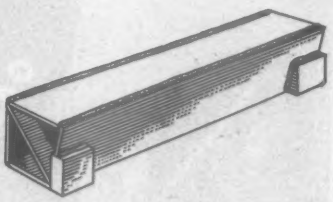
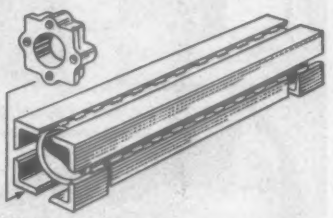


Original Design *of bed frame for textile machine was difficult to machine accurately . . . required stress relieving.*

increasing the YIELD



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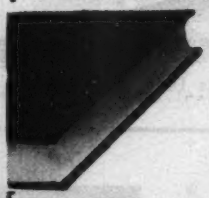

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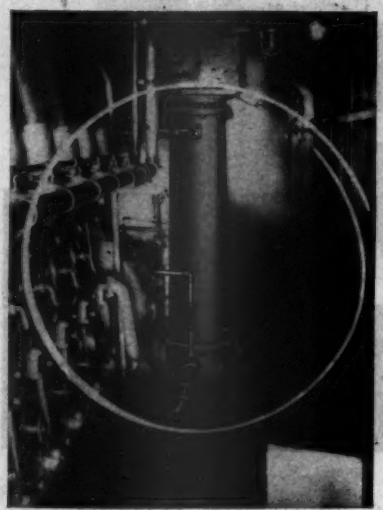

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Caster Quiz

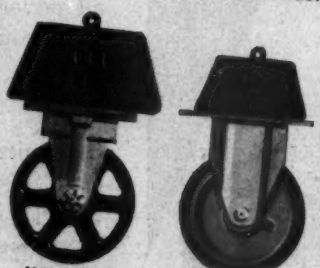
A "quick facts" feature with helpful suggestions on the use of casters . . . to reduce materials-handling costs, the "Reducible 30%"*

Q. How can light, portable equipment roll easier on rough floors or over obstacles?

A. On the amazing new Bassick "Flying Saucer" Caster. Its saucer-like 3" wheel, set at a 45° angle, rides over rough spots and obstacles equal to an ordinary wheel twice the size . . . with the extra asset of low overall height that cuts tipping danger. Low-cost. Ideal for shirt racks (below), shoe racks, garage equipment, etc.

Q. Should metal and rubber-tread wheels of equal size carry equal loads?

A. No. Figure that soft rubber-tread wheels should carry about 50% of the load carried by metal or hard-tread composition wheels of equal size.

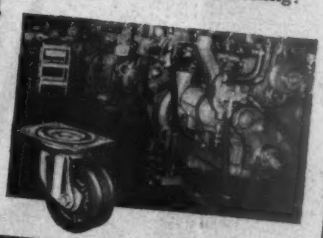


METAL OR HARD-TREAD

SOFT RUBBER-TREAD

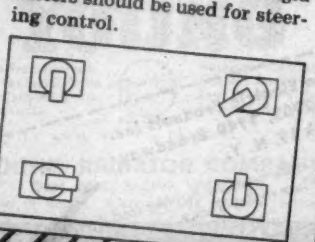
Q. Is there a simple way to set up a controlled-movement, easy-rolling assembly line?

A. Use Bassick Grooved-Wheel Casters on angle iron track, as Cummins Engine Company, Inc., successfully does in assembling its diesel engines. This low-cost scheme gives controlled flow, easy movement, great flexibility. Track is easily installed, self-cleaning.



Q. When should only swivel casters be used on trucks?

A. For limited or confined areas where equipment must frequently move sideways to machines, bins, etc. This arrangement is not advised for long, straight travel, where a combination of swivel and rigid casters should be used for steering control.



Q. What's an easy way to raise and move heavy equipment?

A. A portable A-frame, on Bassick Casters, supports hoists, and can be moved throughout the plant to carry engines, heavy machine parts, etc. Bassick Heavy-Duty Casters (sizes for loads up to 10,000 lbs. or more per caster) add flexibility, in any direction, at any time.

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* According to cost analysts, materials-handling (about 30% of total cost) affords about the only real opportunities for cost reduction today.

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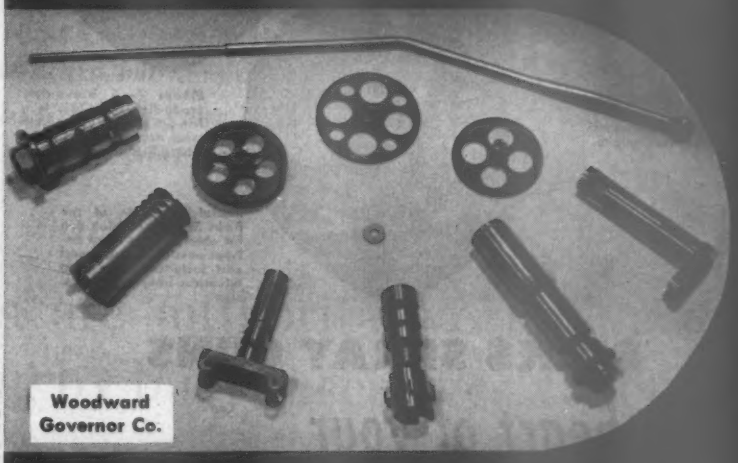

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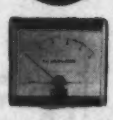

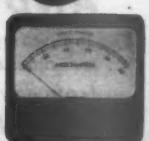

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MISCELLANEOUS EQUIPMENT

Begins on page 188

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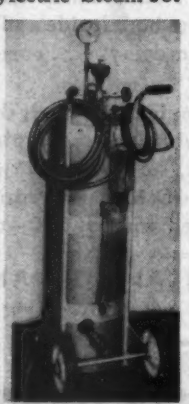

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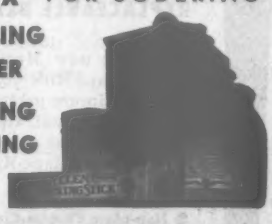

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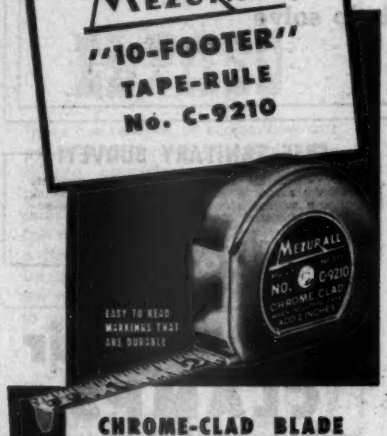

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New developments in industrial lighting

General Electric reports on five years' progress toward more production, fewer accidents, less spoilage, less fatigue

Are you getting the most out of your lighting? Check the items listed below and ask yourself how much you know about these new developments in factory lighting—all of them have come to the fore in the past five years.

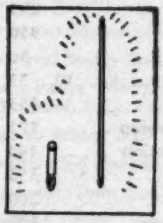
1. SLIMLINE FLUORESCENT

This is fluorescent lighting with long, thin tubes up to eight feet long. Chief advantages for industry are simple and very easy maintenance, high efficiency.

2. R-52 LAMPS

These are 500 and 750 watt lamps that have built-in reflectors. Excellent for high-bay areas, such as foundries, and other areas where it is difficult to clean lighting equipment.

3. IMPROVED MERCURY LAMPS

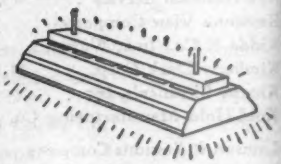


The 3000 watt mercury lamp produces light at lowest overall cost—an enormous amount of light from one source. General Electric's new 400-watt EH-1 lamp now gives 25% more light, important in saving energy and materials.

4. PLANNED MAINTENANCE

In many cases, regular cleaning, plus replacement of lamps in groups on a regular schedule, produces important savings in cost of light.

5. BETTER LIGHT DISTRIBUTION AND BETTER SHIELDING



New fluorescent fixtures, available from a number of manufacturers, direct some of the light upward, to avoid undesirable extremes of contrast between work and surroundings. And better shielding helps reduce uncomfortable glare.

6. HIGHER LIGHTING LEVELS

Not so many years ago, fifty foot-candles seemed like a high level in industry. But experience indicates this should be a *minimum* in most types of work.

7. SIMPLIFIED FLUORESCENT LINE

General Electric's line of four (4) white fluorescent lamps ends earlier confusion about which color of white fluorescent to buy. Use *Standard* White (cool or warm) where efficiency is most important; use *DeLuxe* White (cool or warm) where completely satisfactory color rendition is required.

If you're planning new lighting, be sure to look into the new developments listed above. And even if you modernized your lighting as recently as five years ago, it will pay you to check into them. By bringing the lighting in your plant up to the latest standards, chances are you can boost production, cut down accidents, have less spoilage, reduce fatigue. Let us help you with your production lighting. Call your nearest G-E lamp office. Or see your G-E lamp supplier or your local electric service company. Lamp Department, General Electric Company, Nela Park, Cleveland 12, Ohio.

You can put your confidence in—

GENERAL ELECTRIC

SQUARE D's
DESIGN LEADERSHIP

SAFETY SWITCHES

TYPES A*, C and D
30, 60, 100 and 200 Amp. Sizes

40 YEARS DESIGN LEADERSHIP

is reflected in the many design and operating features of this completely new line

Type A switches have full interlock, visible blades and magnetic arc plate as well as a simple, quick-make-and-break mechanism, dead front line terminals, positive pressure fuse clips, multi-spring jaws, silver-plated current carrying parts and removable pressure connectors.

**Types C and D resemble Type A in appearance but differ in construction details*

Write **for Bulletin 3100 for further details. Square D Company, 6060 Rivard Street, Detroit 11, Michigan**

ASK YOUR ELECTRICAL DISTRIBUTOR FOR SQUARE D PRODUCTS

SQUARE D COMPANY

DETROIT • MILWAUKEE • LOS ANGELES

SQUARE D COMPANY CANADA LTD., TORONTO • SQUARE D de MEXICO, S.A., MEXICO CITY, D.F.

How to make a bit bite better

POWER drilling goes faster and easier when smooth power is transmitted to the drill. Black and Decker builds smooth power performance into the ¼" electric drills shown below by mounting chuck spindles on Timken tapered roller bearings.

Due to the line contact between rollers and races, Timken® bearings give spindles maximum support—free from vibration. And since Timken bearings carry both radial and thrust loads in any combination, end-play can be controlled to any desired limits.

Tools that are Timken bearing-equipped *keep* their precision. Friction in Timken bearings is virtually non-existent because of the true rolling motion of Timken bearings, plus their incredibly smooth surface finish. Bearing wear is kept to a minimum for Timken bearing rollers and races are made from Timken fine alloy steel—case hardened to give a hard, wear-resistant surface and a tough, shock-resistant inner core.

Insist that the tapered roller bearings you buy carry the trade-mark "Timken". And remember, Timken tapered roller bearings add an extra measure of value to the machine in which they are used. The Timken Roller Bearing Company, Canton 6, Ohio. Canadian plant: St. Thomas, Ont. Cable address: "TIMROSCO".

This symbol on a product means its bearings are the best.

BLACK & DECKER *have standardized on Timken bearings for the spindles of their universal drill line above ½" size. Photo shows ¼" Black & Decker drills in operation.*

IT'S TIMKEN BEARINGS FOR VALUE!

To get the best value in bearings you may find this simple formula helpful:

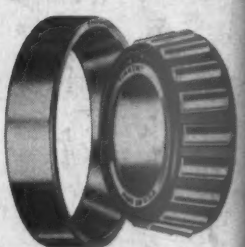
$$Value = \frac{quality + service + public\ acceptance}{price}$$

Obviously a big advantage *above* the line gives you more value than a small one *below*. No other bearing can match the uniform high quality, engineering and field service and overwhelming public acceptance you get with Timken bearings.

TIMKEN

TRADE-MARK REG. U. S. PAT. OFF.

TAPERED ROLLER BEARINGS



NOT JUST A BALL ○ NOT JUST A ROLLER ⬭ THE TIMKEN TAPERED ROLLER ⬭ BEARING TAKES RADIAL ◎ AND THRUST —◎— LOADS OR ANY COMBINATION —◎—

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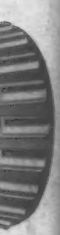
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